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A PRACTICAL PRIMARY ARITHMETIC



NOBLE AND STEVENS

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A PRACTICAL PRIMARY ARITHMETIC



A PRACTICAL PRIMARY ARITHMETIC

BY

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CHARLES SCRIBNER'S SONS

1911

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PREFACE

THIS elementary Arithmetic has been prepared with the hope of giving to little children a First Book in Arithmetic in which they may learn with interest and pleasure the fundamental arithmetical processes and their expression by means of figures and symbols, and, at the same time, become acquainted with many helpful facts and much useful information. Therefore many of the problems are based on nature study and practical everyday life.

Too often the study of Arithmetic is dull and uninteresting because of the subject matter, — the fault being not in the principles of arithmetic, but in the thought content of the problems. The authors have therefore purposely introduced from time to time carefully prepared oral exercises, which they believe will interest, as well as drill and instruct, the pupil. It is hoped that these will relieve the tedium of the steady “grind” so often found in the teaching of arithmetic.

The general plan has been to present by itself Addition, as far as *five*; next, to present Addition and Subtraction together through *eighteen*.

It will be noticed that in such subtractions as

	From 17
	Take 9

nothing is said about “borrowing,” because the pupil has just learned that 17 is the sum of 9 and 8, etc. “Borrowing” is explained later on in the book. Multiplication and Division are next taken up and taught together,

and only through the 10th line. These two subjects are taught together on the ground that while the pupil is learning that five 8's are 40 he may easily learn that 8 is contained in 40 five times.

The study of Fractions is begun during the learning of the Multiplication and Division Tables, in this order: first, halves and thirds of numbers that are products in the multiplication tables, and later, fourths and fifths of numbers that are also products in the multiplication tables. This is done for the reason that it is not difficult for one to learn the half of a number at the time that he learns that the number is the sum of two equal numbers.

Later, the subject of Fractions is continued by introducing an objective study of diagrams. Such an objective problem is that on page 77, where

"A horizontal line is drawn $\frac{1}{8}$ shorter than I wish," the problem being to make it the length I wish, will prove to be not only of value in itself but of excellent preparatory value for the study of percentage.

It is believed that teachers will note with pleasure how the most elementary problems are used as a preparation for more advanced work,—for instance, page 155, example 7:

"An article that cost 40 cents was sold for 35 cents. How many cents were lost? (Subtraction.) What part of the cost was lost? (Fractions.) What per cent of the cost was lost? (Percentage.)"

Again, an effort has been made to give a great deal of drill work in the use of the figure processes involved in the four fundamental rules. Of course, the teacher will give original supplementary work whenever it is *needed*.

The methods used in the book are the results of the classroom experience of the authors and have been carefully tested.

From time to time at County Institutes and at Teachers' Meetings many valuable suggestions have been received by the authors, and that these suggestions have been found profitable may be seen by a glance at the pages of the book. Grateful acknowledgments are hereby made to the many fellow teachers whose helpful assistance has helped to make the book what it is.

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PRIMARY ARITHMETIC

One, two, buckle my shoe,
Three, four, shut the door,
Five, six, pick up sticks,
Seven, eight, lay them straight,
Nine, ten, count them again.



COUNTING

EXERCISE 1.—ORAL

1. How many lines do you see? _____
2. How many dots are here? • •
3. Count the boys in the picture.
4. How many are rolling hoops?
5. How many of the boys have on caps?
6. How many hats do you see?



EXERCISE 2.—ORAL

1. Mary may show me three desks.
2. James, show me five books.
3. Frank, walk eight steps.
4. Each of you hold up four fingers, six fingers, eight fingers, seven fingers.
5. How many legs has a fly?
6. Count ten.
7. How many days in a week?
8. How many cents in a dime?
9. How many boys on a baseball team?
10. How many cents in a nickel?
11. How many fingers on one hand?
12. How many thumbs on each hand?
13. How many thumbs on both hands?
14. How many fingers on both hands?
15. How many years old are you?
16. How many upper teeth have you?
17. How many lower teeth have you?
18. How many fingers and thumbs on both hands?
19. How many windows in this schoolroom?
20. How many desks in one row of this schoolroom?

Numbers are the words that tell us *how many*.

Figures stand for numbers.

EXERCISE 3.—WRITTEN

1. Write figures to stand for the following numbers of objects :

one book,	five ships,
four balls,	two girls,
six apples,	three boys,
nine chickens,	seven sticks,
ten leaves,	eight blocks.

2. Draw as many short straight lines as each of the numbers 3, 6, 8, 4, stand for.





3. Draw as many dots, lines, or pictures as each of these figures stand for : 2, 9, 1, 10, 5.

Copy these sentences and write the missing word :

4. There are — cents in a nickel.
5. There are — cents in two nickels.
6. There are — nickels in one dime.
7. There are — cents in one dime.
8. There are — boys on a baseball team.
9. There are — days in one week.
10. I have — fingers on each hand.
11. I have — fingers on both hands.
12. I have — thumbs on both hands.
13. There are — windows in my schoolroom.
14. I am — years old.
15. Two nickels make — dime.

ADDITION

EXERCISE 4.—ORAL

1. John, hold up one hand. Hold up the other hand.
2. How many are one hand and one hand?
3. How many are one  and one  ?
4. How many are one  and  ?
5. How many are one and one of anything?

One and one are two.

$$1 + 1 = 2$$

$$\bullet \quad 1$$



$$\bullet \quad \frac{1}{2}$$

+ stands for "and" or "add."

It is called **the sign of addition**.

= stands for "equals," "is," or "are."

It is called **the sign of equality**.

6. How many are  and  ?
7. How many are one boy and two boys?
8. How many are 2 and 1?

Two and one are three.



$$2 + 1 = 3$$

$$1 + 2 = 3$$

$$\bullet \quad 1 \quad 2 \quad \bullet \bullet$$

$$\bullet \bullet \quad \frac{2}{3} \quad \frac{1}{3} \quad \bullet$$



EXERCISE 5.—ORAL



1. How many are  and  ?
2. How many are one leaf and three leaves ?
3. How many are three and one ?

Three and one are four.

$$3 + 1 = 4$$

$$1 + 3 = 4$$





 $\frac{3}{4}$	$\frac{1}{4}$	$\frac{3}{4}$	 $\frac{4}{4}$
--	---------------	---------------	--

4. How many are  and  ?
5. How many are two and two ?
6. Two and two are four.

$$2 + 2 = 4$$

$$2 \quad \bullet \bullet$$



$$\frac{2}{4} \quad \frac{\bullet \bullet}{4}$$

7. How many are    and  ?
8. How many are one flower and four flowers ?
9. How many are four and one ?



Four and one are five.

$$4 + 1 = 5$$

$$1 + 4 = 5$$

 $\frac{4}{5}$	$\frac{1}{5}$	$\frac{4}{5}$	 $\frac{5}{5}$
--	---------------	---------------	--

EXERCISE 6.—ORAL

- How many are  and  ?
- How many are two birds and three birds ?
- How many are three and two ?

Three and two are five.

$$3 + 2 = 5$$

$$2 + 3 = 5$$

• •	2	3	• •
• •	3	2	• •
<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>

EXERCISE 7.—WRITTEN

Draw lines, dots, or pictures to represent the figures in the following, and write the proper figure in place of the “?”:

$1 + 1 = ?$

$2 + 1 = ?$

$1 + 3 = ?$

$3 + 2 = ?$

$3 + 1 = ?$

$4 + 1 = ?$

$2 + 3 = ?$

$1 + 2 = ?$

$2 + 2 = ?$

Draw lines, or dots, or pictures to represent the figures in the following, and write the proper figure in place of the “?”:

$1 + 1 = ?$

$2 + 1 = ?$

$1 + 3 = ?$

$3 + 2 = ?$

$2 + 3 = ?$

$1 + 2 = ?$



$2 + 2 = ?$

$3 + 1 = ?$

Add the following:

2	1	1	1	1	2	1	2	1
2	3	1	2	2	1	2	2	3
<u>1</u>	<u>1</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>

EXERCISE 5.—ORAL



1. How many are  and  ?
2. How many are one leaf and three leaves ?
3. How many are three and one ?

Three and one are four.

$$3 + 1 = 4$$

$$1 + 3 = 4$$





•	1	3	••
••	3	1	••
<hr style="width: 100%;"/>	<hr style="width: 100%;"/>	<hr style="width: 100%;"/>	<hr style="width: 100%;"/>
4	4	4	4

4. How many are  and  ?
5. How many are two and two ?
6. Two and two are four.

$$2 + 2 = 4$$

$$2 \quad \bullet \bullet$$

$$\frac{2}{4} \quad \frac{\bullet \bullet}{4}$$

7. How many are    and  ?
8. How many are one flower and four flowers ?
9. How many are four and one ?

Four and one are five.

$$4 + 1 = 5$$

$$1 + 4 = 5$$

•	1	4	••
••	4	1	•
<hr style="width: 100%;"/>	<hr style="width: 100%;"/>	<hr style="width: 100%;"/>	<hr style="width: 100%;"/>
5	5	5	5

EXERCISE 8.—ORAL

1. Father gave James a cent, which he soon lost. How much money did he then have? One less one is how many?

Nothing is represented by 0, which is called **naught**, **cipher**, or **zero**.

— is the sign which means **less**, or **take from**, or **take away**, or **subtract**. It is called **the sign of subtraction**.

2. Harry had two marbles and lost one of them. How many had he left?

3. George picked three quarts of strawberries and gave two quarts to Henry's mother. How many quarts had he left?

4. Jane had 4 cents and spent 2 cents. How many had she left?

5. Edward found a nest containing 4 eggs. In carrying them home he broke one. How many had he then?

6. How many are 3 and 1? 4 less 1? 4 less 3?

7. Read the following and call the missing figure:

$4 - 2 = ?$	$3 - 2 = ?$	$4 - 1 = ?$	$5 - 4 = ?$
$5 - 3 = ?$	$4 - 3 = ?$	$5 - 2 = ?$	$3 - 1 = ?$

EXERCISE 9.—WRITTEN

Copy the following and write the proper figure under each:

From	2	3	4	4	3	4	1
Take	<u>1</u>	<u>2</u>	<u>3</u>	<u>1</u>	<u>1</u>	<u>2</u>	<u>1</u>

EXERCISE 10.—ORAL

1. It is 2 o'clock. What time was it 1 hour ago?
2. John earned 2 cents, his mother gave him 2 cents more, and he then lost 1 cent. How many cents did he still have left?
3. I have 3 cents and wish to mail a letter. How much money shall I have left after buying a two-cent stamp for my letter?
4. A match box measures 4 inches around, one side measures 1 inch. How many inches do the other sides measure?
5. A three-sided piece of paper measures 3 inches around. If one side is 1 inch long, how long are the other sides?
6. A rug has 4 red stripes, 2 green stripes, and 3 white stripes. How many green and white stripes in the rug?
7. How many more red stripes than green?
8. How many more red than white?
9. How many more white than green?
10. How many are five dollars less two dollars?
11. How many are five cents less three cents?
12. John struck at the ball four times and missed it each time. The umpire called "two balls." How many strikes were called?
13. Mary wrote a letter to her aunt. Her mother told her that she had spelled five words wrong, and showed her three of them. Mary then found the others herself. How many did Mary find?

COUNTING TWELVE



One old Oxford opening oysters ;

Two tee-totums totally tired of trying to
trot to Tadbury ;

Three tall tigers tipling tenpenny tea ;

Four fat farmers fanning fainting fleas ;

Five frippy Frenchmen foolishly fishing for flies ;

Six sportsmen shooting snipes ;

Seven Severn salmon swallowing shrimps ;

Eight Englishmen eagerly examining Europe ;

Nine nimble noblemen nibbling nuts ;

Ten tinkers tinkling upon ten tin tinder boxes with ten-
penny tacks ;




Eleven elephants elegantly equipped ;

Twelve typesetters typically translating types.

EXERCISE 11. — ORAL



1. How many boys on a football team ?
2. Count twelve.
3. How many months in a year ?
4. How many inches in a foot ?
5. How many things in a dozen ?

EXERCISE 12. — ORAL

1. How many stripes on our flag?
2. How many days in two weeks?
3. How many cents in three nickels?
4. How many ounces in a pound?
5. How many upper and lower teeth have you?
6. Count from 1 to 20.
7. How many are   and ?
8. How many are one rabbit and five rabbits?
9. How many are five and one?



Five and one are six.

$$\begin{array}{r} 5 \\ 1 \\ \hline 6 \end{array} \quad \begin{array}{l} 5 + 1 = 6 \\ 1 + 5 = 6 \end{array} \quad \begin{array}{r} 1 \\ 5 \\ \hline 6 \end{array}$$

10. How many are  and ?
11. How many are two dolls and four dolls?
12. How many are four and two?

Four and two are six.

$$\begin{array}{r} 4 \\ 2 \\ \hline 6 \end{array} \quad \begin{array}{l} 4 + 2 = 6 \\ 2 + 4 = 6 \end{array} \quad \begin{array}{r} 2 \\ 4 \\ \hline 6 \end{array}$$

13. How many are  and ?
14. How many are three and three?

Three and three are six.

$$\begin{array}{r} 3 + 3 = 6 \\ 3 \\ 3 \\ \hline 6 \end{array}$$

SUBTRACTION AND ADDITION

EXERCISE 13. — ORAL

SUBTRACTION

1. Three boys were playing together in the fields. One went back home. How many then remained ?
2. If you have five cents and spend two of them, how many are left ?
3. A man who has six dollars owes two dollars. How much will he have if he pays his debts ?
4. A man started to walk to the city, which was six miles away. He stopped to rest after he had walked three miles. How far from the city was he while he was resting ?
5. Five birds were on a fence, but one of them flew away. How many remained ? How many are five less two ?
6. A lady bought a hat for four dollars and handed the clerk a five-dollar bill. How much change should the clerk give the lady ?
7. If I have six marbles and lose five, how many shall I then have ? How many are six less one ? Six less two ?
8. If you have six pencils and give away four of them, how many will you have left ?

EXERCISE 14. — WRITTEN



Subtract the following :

$$\begin{array}{r}
 1. \quad 6 \quad 6 \quad 5 \quad 6 \quad 5 \quad 6 \quad 5 \quad 6 \quad 5 \\
 \quad \quad 3 \quad 4 \quad 1 \quad 2 \quad 3 \quad 1 \quad 2 \quad 5 \quad 4 \\
 \quad \quad \underline{\quad} \quad \underline{\quad} \quad \underline{\quad} \quad \underline{\quad} \quad \underline{\quad} \quad \underline{\quad} \quad \underline{\quad} \quad \underline{\quad} \quad \underline{\quad}
 \end{array}$$

Add the following :



$$\begin{array}{r}
 2. \quad 2 \quad 3 \quad 1 \quad 2 \quad 3 \quad 4 \quad 2 \quad 2 \quad 1 \\
 \quad \quad 1 \quad 1 \quad 2 \quad 2 \quad 2 \quad 1 \quad 1 \quad 1 \quad 4 \\
 \quad \quad \underline{\quad} \quad \underline{\quad} \quad \underline{\quad} \quad \underline{\quad} \quad \underline{\quad} \quad \underline{\quad} \quad \underline{\quad} \quad \underline{\quad} \quad \underline{\quad}
 \end{array}$$

EXERCISE 15. — ORAL**ADDITION**

- How many are  and  ?
- How many are one squirrel and six squirrels ?
- How many are six and one ?

Six and one are seven.

$$\begin{array}{r}
 6 \\
 1 \\
 \hline
 7
 \end{array}
 \quad
 \begin{array}{r}
 6 + 1 = 7 \\
 1 + 6 = 7
 \end{array}
 \quad
 \begin{array}{r}
 1 \\
 6 \\
 \hline
 7
 \end{array}$$



- How many are  and  ?
- How many are two tops and five tops ?
- How many are five and two ?

Five and two are seven.

$$\begin{array}{r}
 5 \\
 2 \\
 \hline
 7
 \end{array}
 \quad
 \begin{array}{r}
 5 + 2 = 7 \\
 2 + 5 = 7
 \end{array}
 \quad
 \begin{array}{r}
 2 \\
 5 \\
 \hline
 7
 \end{array}$$

EXERCISE 16.—ORAL

ADDITION

- How many are  and ?
- How many are three horses and four horses?
- How many are four and three?

Four and three are seven.

$$\begin{array}{r} 4 \\ 3 \\ \hline 7 \end{array} \quad \begin{array}{l} 4 + 3 = 7 \\ 3 + 4 = 7 \end{array} \quad \begin{array}{r} 3 \\ 4 \\ \hline 7 \end{array}$$

EXERCISE 17.—WRITTEN

ADDITION

Copy the following and write the proper number in place of the “?” :

$$\begin{array}{r} 1. \quad \begin{array}{ccccccccc} 1 & 2 & 5 & 3 & 4 & 2 & 1 & 4 & 6 \\ 5 & 4 & 1 & 3 & 2 & 5 & 6 & 3 & 1 \\ \hline ? & ? & ? & ? & ? & ? & ? & ? & ? \end{array} \end{array}$$

$$\begin{array}{r} 2. \quad \begin{array}{ccccccccc} ? & 2 & ? & 5 & 2 & ? & 2 & ? & 1 \\ 4 & ? & 3 & ? & ? & 3 & ? & 1 & ? \\ \hline 7 & 6 & 6 & 7 & 6 & 7 & 6 & 7 & 6 \end{array} \end{array}$$

Copy and find the sum of the following :

$$\begin{array}{r} 3. \quad \begin{array}{ccccccccc} 1 & 2 & 2 & 2 & 3 & 3 & 4 & 2 & 2 \\ 2 & 1 & 3 & 1 & 2 & 2 & 1 & 2 & 2 \\ \hline 4 & 3 & 2 & 2 & 2 & 1 & 2 & 3 & 2 \\ \hline \end{array} \end{array}$$

EXERCISE 18.—ORAL

ADDITION

1. Two boys are in one boat, three in another, and two in a third boat. How many boys in the boats?

2. James caught 3 fish, Harry 2, and Frank 2. How many fish did the boys catch?

3. A cup cake requires 1 cup of butter, 2 cups of sugar, and 3 cups of flour. How many cups in all are required to make a cup cake?

4. The school is 2 miles from John's home. How far does he walk to and from school?

5. An apple twig grew 4 inches in one year and 3 inches the next year. How many inches did it grow in the two years?

6. Our baseball team made 1 run in the first inning, 2 in the third, 2 in the fifth, and 1 in the ninth. How many runs did it make in all?

7. The other team made 2 runs in the third inning and 3 in the ninth. How many runs did it make in all?

8. If 2 leaves on one twig and 3 on another are eaten by insects, how many leaves are eaten in all?



9. James spends 4 cents for a pencil and 3 cents for some paper. How much does he spend in all?

10. A letter requires a 2-cent stamp; a newspaper, a 1-cent stamp. How many cents must you give for stamps enough to send three letters and one paper?

11. How many cents' worth of stamps are required for two letters and three newspapers?



EXERCISE 19.—ORAL

ADDITION

1. How many are  and  ?
2. One knife and 7 knives are how many knives ?
3. How many are seven and one ?
4. Read these numbers from left to right and tell their sum, and then tell their sum in the vertical lines :



$$7 + 1 = 8$$

$$\frac{1}{?} + \frac{7}{?} = 8$$

5. How many are  and  ?
6. Two forks and six forks are how many forks ?
7. How many are six and two ?
8. Read these numbers from left to right and tell their sum, and then tell their sum in the vertical lines :

$$6 + 2 = 8$$

$$\frac{2}{?} + \frac{6}{?} = 8$$

9. How many are  and  ?
10. How many are three spools and five spools ?
11. How many are five and three ?
12. Read these numbers as you read (4) and (8):

$$5 + 3 = 8$$

$$\frac{3}{?} + \frac{5}{?} = 8$$

EXERCISE 20.—ORAL**SUBTRACTION**

1. A man who had seven cows sold six of them. How many of them did he then have?

2. Seven boys were riding in a wagon. Two of them jumped off. How many were then in the wagon?

3. A storm broke six of the eight panes of glass in a window. How many panes were not hurt by the storm?

4. If you have 7 cakes and give 4 of them to your play-mates, how many will you then have? How many are 7 less 3?

5. How many are 5 less 2? How many are 7 less 2? 7 less 5?

6. If you have 8 dollars and spend 4 dollars, how many dollars do you have left?

EXERCISE 21.—WRITTEN

Subtract the following:

1.	6	8	7	5	6	8	7	8	6
	<u>2</u>	<u>7</u>	<u>3</u>	<u>3</u>	<u>1</u>	<u>6</u>	<u>5</u>	<u>1</u>	<u>4</u>
2.	8	6	7	8	7	8	7	7	5
	<u>2</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>4</u>	<u>6</u>	<u>1</u>	<u>2</u>

Add the following:

3.	2	1	1	1	1	2	1	1
	<u>2</u>	<u>2</u>	<u>1</u>	<u>1</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>
	1	2	2	2	1	1	1	2
	<u>2</u>	<u>2</u>	<u>1</u>	<u>3</u>	<u>1</u>	<u>2</u>	<u>1</u>	<u>1</u>
	<u>1</u>	<u>1</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>

EXERCISE 22.—ORAL

ADDITION

1. A cabbage worm ate 5 cabbage leaves one day and 3 the next. How many leaves did the worm eat in all ?

2. Mary's mother made 3 glasses of apple jelly, 2 of currant, and 3 of grape jelly. How many glasses did she make in all ?

3. John fed his colt 2 quarts of oats, and his draft horse 6 quarts. How many quarts were fed in all ?

4. An apple twig grew 3 inches the first year, 3 inches the second year, and 2 inches the third year. What was the growth for the three years ?

5. Mr. Jones lives 4 miles from the railroad station. How many miles will he travel in going from his home to the station and back ?

6. A brown Leghorn hen laid 4 eggs in the week ; a Plymouth Rock laid 3 eggs during the same week. How many did both lay ?

7. How many cents in a nickel and two cents ?

8. Lucy is 1 year older than her brother Frank, who is just 7 years old. How old is she ?

9. How much will you have to pay for a 2-cent pencil, a 3-cent tablet, a 2-cent eraser, and a 1-cent pen ?

10. In a schoolroom there are 4 pictures on one wall, 2 on another, and 1 on another. How many pictures in the room ?

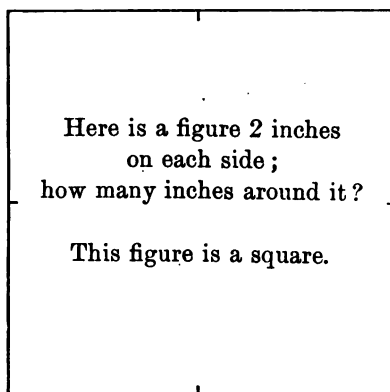
LINES AND MEASURES

EXERCISE 23.—WRITTEN

1 inch	1 inch	1 inch	1 inch
--------	--------	--------	--------

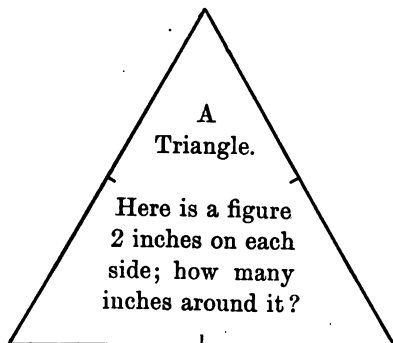
1. Draw a line 2 inches long.

2.



3. Draw a figure 2 inches long and 1 inch wide. How many inches around the figure ?

4.



EXERCISE 24.—ORAL

1. A square measures 3 inches on a side. How many inches around it?

2. A figure is 3 inches long and 1 inch wide. How far around it?

3. A three-sided figure is 1 inch on one side, 2 inches on the second side, and 3 inches on the third side. How far around the figure?

4. How many inches around a four-sided figure the length of whose sides are 1 inch, 2 inches, 3 inches, and 2 inches?

5. A three-sided figure measures 2 inches, 3 inches, and 4 inches on the sides. What is the distance around the figure?

EXERCISE 25.—WRITTEN

Copy and find the sum of:

$$\begin{array}{r} 1. \quad \begin{array}{cccccccc} 3 & 3 & 2 & 1 & 3 & 2 & 2 & 1 \\ 2 & 1 & 3 & 2 & 2 & 4 & 2 & 4 \\ \hline 1 & 2 & 1 & 2 & 3 & 1 & 4 & 2 \end{array} \end{array}$$

$$\begin{array}{r} 2. \quad \begin{array}{cccccccc} 3 & 2 & 5 & 1 & 1 & 2 & 2 & 3 \\ 3 & 1 & 1 & 3 & 4 & 3 & 5 & 2 \\ \hline 2 & 2 & 2 & 2 & 3 & 3 & 1 & 2 \end{array} \end{array}$$

3. Copy the following and write the proper figure in place of the “?”:

$$\begin{array}{llll} ? + 7 = 9, & ? + 4 = 9, & ? + 2 = 9, & ? + 1 = 9, \\ ? + 3 = 9, & ? + 5 = 9, & ? + 8 = 9, & ? + 6 = 9. \end{array}$$

EXERCISE 26. — ORAL

1. How many are 8 flags and 1 flag?
2. How many are 7 forks and 2 forks?
3. How many are 2 horses and 7 horses?
4. How many are 6 nails and 3 nails?
5. How many are 3 screws and 6 screws?
6. How many are ||||| and ||||?
7. How many are 4 and 5?
8. Tell the sum of each of the following :

1	8	2	2	7	3	3	6	4	5
8	1	5	7	2	4	6	3	5	4
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

EXERCISE 27. — WRITTEN

Copy and add the following :

1.	7	4	5	3	6	2	3	1
	1	2	2	3	1	2	5	6
	<u>1</u>	<u>2</u>	<u>2</u>	<u>3</u>	<u>2</u>	<u>5</u>	<u>1</u>	<u>1</u>
2.	2	2	4	3	3	2	1	2
	5	4	3	1	2	4	4	2
	<u>2</u>	<u>2</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>3</u>	<u>4</u>	<u>4</u>
3.	1	2	1	2	3	1	2	2
	4	1	2	1	1	2	2	1
	<u>1</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>1</u>	<u>2</u>
	2	1	2	1	1	2	3	2
	<u>1</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>1</u>	<u>2</u>

EXERCISE 28.—ORAL

1. How many are ||||| and |?
2. How many are nine and one?
3. How many are five and five?
4. How many are eight and two?
5. How many are two and eight?
6. How many are seven and two?
7. How many are seven and three?
8. How many are two and seven?
9. How many are three and seven?
10. How many are five and four?
11. How many are four and six?
12. How many are six and four?

EXERCISE 29.—WRITTEN

Copy and add the following:

1.	1	4	2	7	3	3	4	5
	<u>9</u>	<u>3</u>	<u>8</u>	<u>2</u>	<u>7</u>	<u>5</u>	<u>6</u>	<u>2</u>
2.	5	6	4	7	2	8	7	9
	<u>5</u>	<u>4</u>	<u>5</u>	<u>3</u>	<u>6</u>	<u>2</u>	<u>3</u>	<u>1</u>
3.	1	5	2	2	3	4	4	2
	<u>4</u>	<u>2</u>	<u>4</u>	<u>4</u>	<u>2</u>	<u>1</u>	<u>3</u>	<u>1</u>
	<u>5</u>	<u>2</u>	<u>4</u>	<u>2</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>6</u>
4.	6	2	7	2	2	1	3	1
	<u>1</u>	<u>5</u>	<u>2</u>	<u>3</u>	<u>5</u>	<u>4</u>	<u>3</u>	<u>2</u>
	<u>3</u>	<u>2</u>	<u>1</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>3</u>	<u>7</u>

ADDITION AND SUBTRACTION

EXERCISE 30.—ORAL

1. How many are 8 marbles and 1 marble? How many are 1 and 8? How many are 9 less 1? 9 less 8?
2. How many are 6 books and 3 books? 9 books less 3 books? 9 books less 6 books?
3. How many are nine dollars and one dollar? How many are 10 dollars less 1 dollar? 10 dollars less 9 dollars?
4. How many are 8 and 2? 10 less 2? 10 less 8?
5. How many are 7 and 2? 9 less 2? 9 less 7?
6. How many are 6 and 4? 10 less 6? 10 less 4?
7. How many are 7 and 3? 10 less 3? 10 less 7?
8. How many are 5 and 4? 9 less 4? 9 less 5?
9. How many are five and five? 10 less 5?

EXERCISE 31.—ORAL

How many are:

1. 8 knives less 1 knife? 8 cents less 7 cents?
2. 8 flags less 1 flag? 9 flags less 8 flags?
3. 8 forks less 2 forks? 9 screws less 6 screws?
4. 8 forks less 6 forks? 9 screws less 6 screws?
5. 8 spools less 3 spools? 9 cherries less 5 cherries?
6. 8 *nails* less 5 *nails*? 9 *nails* less 4 *nails*?

Read the following and give the proper figure in place of the "?":

$8 - 1 = ?$	$8 - 3 = ?$	$9 - 7 = ?$
$8 - 7 = ?$	$8 - 5 = ?$	$9 - 6 = ?$
$8 - 2 = ?$	$9 - 1 = ?$	$9 - 3 = ?$
$8 - 6 = ?$	$9 - 8 = ?$	$9 - 4 = ?$
$8 - 4 = ?$	$9 - 2 = ?$	$9 - 5 = ?$

EXERCISE 32.—WRITTEN

Copy and write the proper figure under each example:

1. From	9	8	9	8	9	8	9	8
Take	<u>2</u>	<u>6</u>	<u>8</u>	<u>3</u>	<u>6</u>	<u>5</u>	<u>4</u>	<u>7</u>
2. From	8	9	8	9	8	9	7	9
Take	<u>1</u>	<u>3</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>5</u>	<u>4</u>	<u>7</u>
3. From	10	7	10	6	10	5	10	10
Take	<u>4</u>	<u>5</u>	<u>7</u>	<u>2</u>	<u>8</u>	<u>3</u>	<u>2</u>	<u>5</u>
4. From	10	5	10	7	10	6	10	7
Take	<u>1</u>	<u>2</u>	<u>3</u>	<u>2</u>	<u>6</u>	<u>3</u>	<u>9</u>	<u>4</u>

Copy and add the following:

5. 1	1	1	3	3	5	3	2
8	2	7	3	1	4	4	4
<u>1</u>	<u>6</u>	<u>2</u>	<u>2</u>	<u>6</u>	<u>1</u>	<u>2</u>	<u>3</u>
6. 2	2	2	4	4	3	3	2
2	2	3	3	2	3	3	1
<u>6</u>	<u>5</u>	<u>5</u>	<u>1</u>	<u>4</u>	<u>2</u>	<u>4</u>	<u>5</u>

COMBINATIONS IN ADDITION

EXERCISE 33.—ORAL

The following are all of the combinations of two figures whose sum is not greater than 10. The sum of these combinations should be known at sight.

Let pupils call the sum of the combinations in any order, as, beginning at the top and then taking the other combinations from left to right, we have 10, 9, 10, 8, 6, etc.

				5				
				<u>5</u>				
			4	6	4			
			<u>5</u>	<u>4</u>	<u>4</u>			
		3	4	3	6	3		
		<u>3</u>	<u>3</u>	<u>5</u>	<u>3</u>	<u>7</u>		
	2	3	2	5	2	7	2	
	<u>2</u>	<u>2</u>	<u>4</u>	<u>2</u>	<u>6</u>	<u>2</u>	<u>8</u>	
1	2	1	4	1	6	1	8	1
<u>1</u>	<u>1</u>	<u>3</u>	<u>1</u>	<u>5</u>	<u>1</u>	<u>7</u>	<u>1</u>	<u>9</u>

How many are

5 and 5?	4 and 4?	3 and 3?	2 and 2?
6 and 4?	7 and 3?	8 and 2?	9 and 1?
5 and 4?	6 and 3?	7 and 2?	5 and 3?
6 and 2?	4 and 3?	5 and 2?	4 and 2?

EXERCISE 34. — WRITTEN

Copy and find the sum of the following :

$$\begin{array}{r}
 1. \quad \begin{array}{cccccccc}
 3 & 1 & 1 & 3 & 4 & 2 & 5 & 2 & 1 \\
 1 & 5 & 5 & 1 & 2 & 2 & 2 & 2 & 2 \\
 2 & 3 & 1 & 1 & 2 & 3 & 2 & 1 & 2 \\
 \underline{4} & \underline{1} & \underline{2} & \underline{3} & \underline{1} & \underline{2} & \underline{1} & \underline{5} & \underline{3}
 \end{array}
 \end{array}$$

Copy and find the difference of the following :

$$\begin{array}{r}
 2. \quad \begin{array}{cccccccc}
 9 & 10 & 9 & 10 & 9 & 10 & 8 & 10 & 9 \\
 \underline{1} & \underline{7} & \underline{5} & \underline{6} & \underline{2} & \underline{5} & \underline{3} & \underline{3} & \underline{3}
 \end{array}
 \end{array}$$

$$\begin{array}{r}
 3. \quad \begin{array}{cccccccc}
 10 & 9 & 9 & 10 & 8 & 10 & 9 & 8 & 10 \\
 \underline{7} & \underline{6} & \underline{4} & \underline{9} & \underline{5} & \underline{4} & \underline{7} & \underline{2} & \underline{8}
 \end{array}
 \end{array}$$

Copy and find the sum of the following :





$$\begin{array}{r}
 4. \quad \begin{array}{cccccccc}
 2 & 2 & 1 & 1 & 2 & 4 & 1 & 2 & 1 \\
 1 & 2 & 1 & 3 & 2 & 1 & 2 & 1 & 2 \\
 2 & 2 & 2 & 1 & 1 & 2 & 2 & 2 & 3 \\
 \underline{1} & \underline{1} & \underline{3} & \underline{2} & \underline{2} & \underline{1} & \underline{2} & \underline{1} & \underline{1} \\
 \underline{3} & \underline{2} & \underline{2} & \underline{2} & \underline{2} & \underline{2} & \underline{2} & \underline{4} & \underline{2}
 \end{array}
 \end{array}$$

Copy and find the sum of the following :

$$\begin{array}{r}
 5. \quad \begin{array}{cccccccc}
 3 & 3 & 1 & 1 & 1 & 1 & 3 & 6 & 1 \\
 1 & 1 & 3 & 3 & 2 & 1 & 1 & 1 & 2 \\
 3 & 4 & 1 & 3 & 3 & 2 & 2 & 1 & 1 \\
 \underline{1} & \underline{1} & \underline{1} & \underline{1} & \underline{2} & \underline{2} & \underline{1} & \underline{1} & \underline{2} \\
 \underline{2} & \underline{1} & \underline{3} & \underline{2} & \underline{1} & \underline{4} & \underline{2} & \underline{1} & \underline{2}
 \end{array}
 \end{array}$$

COUNTING BY TENS

EXERCISE 35.—ORAL

1. How many tens in 10 ones? 
1 ten
 2. How many tens in 11 ones? 
1 ten and 1 one
 3. How many tens in 12 ones? 
1 ten and 2 ones
 4. How many tens in 13 ones?
 5. How many tens in 14 ones?
 6. How many tens in 15 ones?
- In 16 ones? In 17 ones? In 18 ones? In 19 ones?
7. How many tens in 20 ones? 
2 tens

EXERCISE 36.—WRITTEN

Express in figures :

One ten and one,	One ten and six,
One ten and two,	One ten and seven,
One ten and three,	One ten and eight,
One ten and four,	One ten and nine,
One ten and five,	Two tens.

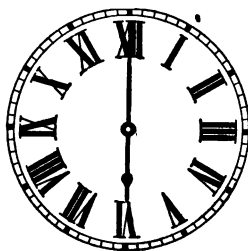
EXERCISE 37.—ORAL

1. How many ones make 1 ten ?
2. How many tens and ones make thirty-seven ?
3. On what page is this example ? Which of the two figures tells the tens ? Which tells the ones ?
4. If a number is expressed by two figures, what does the left-hand figure tell—the tens or the ones ? What does the right-hand figure tell ?
5. The left-hand figure is 2, and the right-hand figure is 9. What is the number ?
6. A certain number is expressed by two figures. The left-hand figure of the number is 2, and the right-hand figure is 5. What is the number ? How many tens and ones in the number ?
7. William and John told me how many fish each had caught. How may I find the number of fish caught by both of them ?
8. If I spend some money at several stores, how can I find out the amount of money I have spent in all ?
9. I owe John for cutting wood, Henry for spading up the garden, and Sam for milking the cows. How can I find the amount of money it will take to pay all three of them ?
10. Mr. Brown pays me seven dollars and Mr. Smith pays me two dollars, and the money received from them is more than enough to pay John, Henry, and Sam. How can I tell the amount I should have left after paying these *three men* ?

TELLING THE TIME OF DAY

EXERCISE 38.—ORAL

1. What time did school begin this morning?
2. Show on the clock face the hour school began.
3. What letters stand for nine o'clock?
4. When it is noon, what time is it?
5. Show 12 o'clock on the clock face.
6. Name the letters and the hours they stand for on the clock face.
7. What are the pointers on the clock face called?
8. What does the shorter hand show? The longer hand?
9. Where are the hands of the clock when it is 6 o'clock?
10. Where are the hands when it is 4 o'clock? (Some clock faces have IIII instead of IV for 4 o'clock.)
11. How long does it take the hour hand to move around the clock face? How long does it take the minute hand to move around?
12. What is 12 o'clock at night called? How long is it from noon to midnight? How many hours in a day?



EXERCISE 39.—WRITTEN

Copy these hours and write after them the letters that stand for them on the clock face:

1 o'clock	3 o'clock
2 o'clock	9 o'clock
4 o'clock	5 o'clock
6 o'clock	10 o'clock
8 o'clock	11 o'clock
7 o'clock	12 o'clock

EXERCISE 40.—ORAL

1. If a letter requires a two-cent stamp, and a paper requires a one-cent stamp, how many cents will be required to pay the postage on two letters and three papers?

2. There are 8 pupils in a class to which 2 more came from another class. How many were there then in the class?

3. In one pound there are 16 ounces. How many tens and ones in 16?

4. In November there are 7 cloudy days and 3 rainy days. How many days in November were either cloudy or rainy?

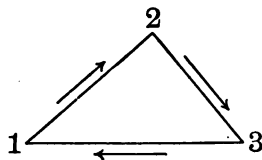
5. A family ate 8 ounces of bread and 2 ounces of butter at breakfast. How many ounces of bread and butter were eaten at breakfast?

6. At dinner the same family ate 6 ounces of bread and 2 ounces of butter. How many ounces of bread and butter were eaten at dinner?

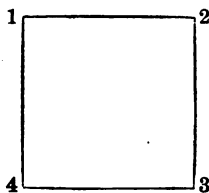
7. A school day is 5 hours long. How many school hours in Wednesday and Thursday?

EXERCISE 41.—ORAL

1. NOTE TO TEACHER. Have pupils add the numbers about the triangle as many times around as you wish. If the first pupil begins at "1" and adds in the direc-

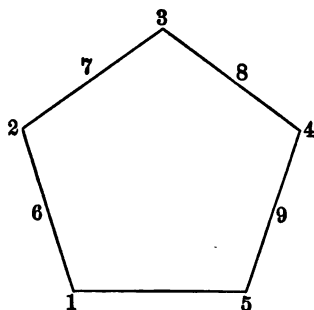


tion of the arrows, let the second pupil begin at "1" and add in the opposite direction. In this way two additions may be had by using each number as the starting point.



2. Add the numbers at each corner of the square in the same way that the numbers about the triangle were added.

3. Add any number to those about the pentagon, and call the sum promptly; as, adding 4 to 1, 6, 2, etc., say "Four, five; four, ten; four, six," etc.



The pentagon may be used for drill in subtraction; as, subtract the numbers from any number, say 12; 12 less 1 is 11, 12 less 6 is 6, 12 less 2 is 10, etc.

The above devices should be used often as a means of drill. They may be quickly placed on the blackboard and used not only in some definitely chosen period, but also at other times in the judgment of the teacher.

THE MONTHS OF THE YEAR

Thirty days hath September,
April, June, and November;
February has twenty-eight alone,
All the rest have thirty-one,
Excepting Leap Year, that's the time
When February's days are twenty-nine.

EXERCISE 42. — WRITTEN

Write in one column the names of the months of the year, and in another column write the number of days in each month; as,

NAME OF THE MONTH	NUMBER OF DAYS
January	—
February	—
March	—
April	—
May	—
June	—
July	—
August	—
September	—
October	—
November	—
December	—

ADDITION AND SUBTRACTION

EXERCISE 43.—ORAL

11 Eleven. Twelve 12.

1. How many are ten and one? Ten and two? Five and five? Five and six? Five and seven? Six and six?

2. A farmer made 8 bales of cotton on one field and 3 bales on another. How many bales did he make on both fields?

3. From here to Blankton is 9 miles. Father lives 3 miles beyond Blankton. How far from here to father's?

4. How many are 2 cars and 9 cars? 8 eggs and 4 eggs?

5. Henry is 7 years old to-day. How old will he be 4 years from to-day?

6. How many are 5 cents, 6 cents, and 1 cent?

7. Call the sum of each of the following and then take from the sum the lower figure, as, beginning at the left, say "Eleven. Eleven less six is five."

5	7	6	3	7	8	9	3	10
<u>6</u>	<u>4</u>	<u>6</u>	<u>8</u>	<u>5</u>	<u>4</u>	<u>2</u>	<u>9</u>	<u>1</u>
6	4	8	5	4	2	9	11	12
<u>5</u>	<u>7</u>	<u>3</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>3</u>	<u>1</u>	<u>2</u>

EXERCISE 44. — WRITTEN

Subtract the following :

$$\begin{array}{r} 1. \quad 11 \quad 11 \quad 12 \quad 11 \quad 12 \quad 12 \quad 11 \quad 12 \quad 11 \\ \quad \underline{6} \quad \underline{4} \quad \underline{6} \quad \underline{8} \quad \underline{5} \quad \underline{4} \quad \underline{2} \quad \underline{9} \quad \underline{1} \end{array}$$

$$\begin{array}{r} 2. \quad 11 \quad 11 \quad 11 \quad 12 \quad 12 \quad 12 \quad 11 \quad 12 \quad 11 \\ \quad \underline{5} \quad \underline{7} \quad \underline{3} \quad \underline{7} \quad \underline{8} \quad \underline{2} \quad \underline{9} \quad \underline{3} \quad \underline{1} \end{array}$$

Add the following :

$$\begin{array}{r} 3. \quad 2 \quad 3 \quad 7 \quad 4 \quad 2 \quad 4 \quad 4 \quad 4 \quad 1 \\ \quad 4 \quad 3 \quad 2 \quad 3 \quad 4 \quad 2 \quad 2 \quad 2 \quad 5 \\ \quad 3 \quad 2 \quad 1 \quad 2 \quad 2 \quad 2 \quad 3 \quad 3 \quad 3 \\ \quad \underline{3} \quad \underline{3} \quad \underline{4} \quad \underline{2} \quad \underline{3} \quad \underline{4} \quad \underline{2} \quad \underline{3} \quad \underline{2} \end{array}$$

EXERCISE 45. — ORAL

13 Thirteen. Fourteen 14.

1. How many are 12 and 1? 13 and 1? 11 and 2?
12 and 2? 11 and 3? 10 and 3? 7 and 7? 7 and 6?
8 and 6? 8 and 5?

2. How many are 9 cents and 4 cents? 4 cars and
10 cars?

3. Call the sum of each of the following groups and
then take the lower figure from the sum :

$$\begin{array}{r} 7 \quad 8 \quad 9 \quad 8 \quad 9 \quad 10 \quad 12 \quad 11 \quad 7 \\ \underline{6} \quad \underline{5} \quad \underline{4} \quad \underline{6} \quad \underline{5} \quad \underline{3} \quad \underline{2} \quad \underline{3} \quad \underline{7} \\ 6 \quad 5 \quad 4 \quad 6 \quad 5 \quad 3 \quad 2 \quad 3 \quad 8 \\ \underline{7} \quad \underline{8} \quad \underline{9} \quad \underline{8} \quad \underline{9} \quad \underline{10} \quad \underline{12} \quad \underline{11} \quad \underline{3} \\ 11 \quad 12 \quad 10 \quad 13 \quad 2 \quad 1 \quad 10 \quad 1 \quad 3 \\ \underline{2} \quad \underline{1} \quad \underline{4} \quad \underline{1} \quad \underline{11} \quad \underline{12} \quad \underline{4} \quad \underline{13} \quad \underline{8} \end{array}$$

EXERCISE 46.—WRITTEN

Subtract the following :

1.	13	14	13	14	14	13	14	13	14
	<u>6</u>	<u>5</u>	<u>5</u>	<u>3</u>	<u>6</u>	<u>3</u>	<u>7</u>	<u>4</u>	<u>2</u>
2.	13	14	13	14	14	13	11	13	14
	<u>7</u>	<u>9</u>	<u>8</u>	<u>11</u>	<u>8</u>	<u>10</u>	<u>3</u>	<u>9</u>	<u>12</u>
3.	13	13	14	14	13	13	14	14	11
	<u>2</u>	<u>1</u>	<u>4</u>	<u>1</u>	<u>11</u>	<u>12</u>	<u>10</u>	<u>13</u>	<u>8</u>

Add the following :

4.	4	5	4	2	4	3	1	5	4
	<u>3</u>	<u>4</u>	<u>3</u>	<u>3</u>	<u>2</u>	<u>3</u>	<u>6</u>	<u>2</u>	<u>4</u>
	2	3	5	4	2	2	1	3	3
	<u>4</u>	<u>2</u>	<u>2</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>4</u>	<u>4</u>	<u>3</u>

EXERCISE 47.—ORAL

15 Fifteen. Sixteen 16.

1. How many are 14 and 1? 15 and 1? 8 and 8? 8 and 7? 10 and 5? 10 and 6? 9 and 6? 9 and 7?

2. There are 11 sacks of flour on a dray. The driver will put on 4 more sacks. How many sacks will then be on the dray?

3. A boy standing in front of his home counts 4 telephone poles in one direction and 12 in another. How many does he count in all?

4. How many are 12 eggs and 3 eggs? 14 hats and 2 hats? 13 cakes and 2 cakes? 3 inches and 13 inches? 10 days and 5 days?

5. Call the sum of the following and then take the lower from the upper number :

8	9	8	9	9	9	7	10	13
<u>7</u>	<u>7</u>	<u>8</u>	<u>6</u>	<u>8</u>	<u>9</u>	<u>3</u>	<u>5</u>	<u>3</u>
11	12	11	12	10	13	15	14	14
<u>4</u>	<u>4</u>	<u>5</u>	<u>3</u>	<u>6</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>11</u>
13	14	16	15	16	16	15	14	16
<u>3</u>	<u>2</u>	<u>2</u>	<u>3</u>	<u>3</u>	<u>7</u>	<u>9</u>	<u>1</u>	<u>9</u>

EXERCISE 48. — WRITTEN

Subtract the following :

1.	15	16	15	16	15	16	15	15	16
	<u>7</u>	<u>8</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>5</u>	<u>9</u>	<u>3</u>
2.	15	16	15	16	16	15	16	16	15
	<u>4</u>	<u>5</u>	<u>3</u>	<u>4</u>	<u>6</u>	<u>2</u>	<u>1</u>	<u>2</u>	<u>1</u>
3.	16	15	16	15	15	16	16	15	16
	<u>13</u>	<u>12</u>	<u>12</u>	<u>10</u>	<u>13</u>	<u>10</u>	<u>11</u>	<u>11</u>	<u>14</u>

Add the following :

4.	4	4	4	6	7	6	7	5	5
	3	5	4	6	1	4	5	5	3
	4	2	5	2	3	4	2	2	3
	<u>4</u>	<u>5</u>	<u>3</u>	<u>1</u>	<u>4</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>5</u>

EXERCISE 49. — ORAL

17 Seventeen. Eighteen 18.

1. How many are 9 and 9? 9 and 8? 10 and 8?
10 and 7? 12 and 6? 16 and 2? 14 and 4? 12 and 5?

2. A farmer sold 11 melons to one merchant and 7 to another. How many did he sell to both?

3. If you have a dime, a nickel, and 2 cents, how much money do you have?

4. What is the total cost of a 10-cent knife, a 3-cent top, and a 5-cent pencil?

5. What is the total cost of a 5-cent ball, a 5-cent whip, and a 7-cent bag of marbles?

6. Call the sum of each group and take the lower number from the sum:

9	15	11	13	18	17	1	17	11
<u>8</u>	<u>3</u>	<u>6</u>	<u>4</u>	<u>2</u>	<u>9</u>	<u>17</u>	<u>5</u>	<u>7</u>
10	12	9	10	14	15	13	14	1
<u>7</u>	<u>6</u>	<u>9</u>	<u>8</u>	<u>4</u>	<u>2</u>	<u>5</u>	<u>3</u>	<u>16</u>

EXERCISE 50.—WRITTEN

Subtract the following:

1.	17	18	17	17	18	17	18	17	18
	<u>8</u>	<u>3</u>	<u>6</u>	<u>4</u>	<u>2</u>	<u>9</u>	<u>17</u>	<u>5</u>	<u>7</u>
2.	17	18	18	18	18	17	18	17	17
	<u>7</u>	<u>6</u>	<u>9</u>	<u>8</u>	<u>4</u>	<u>2</u>	<u>5</u>	<u>3</u>	<u>16</u>

Add the following:

3.	4	5	6	5	2	2	1	2	9
	<u>5</u>	<u>7</u>	<u>7</u>	<u>4</u>	<u>3</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>3</u>
	<u>3</u>	<u>4</u>	<u>3</u>	<u>3</u>	<u>5</u>	<u>7</u>	<u>8</u>	<u>6</u>	<u>3</u>
	<u>5</u>	<u>2</u>	<u>2</u>	<u>6</u>	<u>7</u>	<u>6</u>	<u>7</u>	<u>9</u>	<u>3</u>

ADDITION

EXERCISE 51. — WRITTEN

Find the sum of the following : *

1.	2.	3.	4.	5.
58 miles	23 barrels	11 boxes	42 sheep	31 days
34	17	25	37	28
26	35	12	65	31
15	28	14	18	30
<u>21</u>	<u>92</u>	<u>16</u>	<u>90</u>	<u>15</u>

6.	7.	8.	9.	10.
23	28	54	44	25
15	18	36	10	41
55	48	19	57	64
40	58	19	20	75
28	18	37	15	17
<u>53</u>	<u>38</u>	<u>11</u>	<u>23</u>	<u>12</u>

* "CARRYING"

The teacher should explain "carrying" before the above examples are assigned to the class. The following method is suggested :

Find the sum of 22, 31, 14, and 23.

22 First, add the figures in the ones' or units' column, as "Three,
31 seven, eight, ten." Ten contains 1 ten and no units, therefore
14 write 0 in the units' column and "carry" the 1 ten to the next
23 column, saying "One, three, four, seven, nine." Write the 9 in
90 the tens' column.

EXERCISE 52. — ORAL

1. A man has three cows named Belva, Minna, and Nanna. Belva gives 5 quarts of milk at a milking, Minna gives 8 quarts, and Nanna 9 quarts. How much milk do they give together at a milking?

2. How much more milk does Minna give than Belva?

3. How much more milk does Nanna give than Belva?

4. How much more milk does Nanna give than Minna?

5. A horse travels 6 miles in an hour and a steamboat travels 9 miles in an hour. Which travels faster, and how much faster?

6. A man walks 4 miles in an hour. How many more miles does the horse go in an hour than a man?

7. How much faster does the steamboat go than the man?

8. A box is 10 inches long, 5 inches wide, and 3 inches high. Its length is how many more inches than its width? Its length is how many more inches than its height? Its width is how many more inches than its height? How many inches in its entire length, width, and height?

9. A driving horse is fed 4 quarts of oats, a colt 2 quarts, and a draught horse 6 quarts. How many more quarts are fed to the driving horse than to the colt? How many more quarts are fed to the draught horse than to the driving horse? How many more to the draught horse than to the colt?

10. How many quarts are fed to all three?

UNITED STATES MONEY

TABLE

5 cents (cts.) make 1 nickel
10 cents make 1 dime
10 dimes, or
100 cents, make 1 dollar

EXERCISE 53.—ORAL

1. How many cents in a nickel?

NOTE. Five cents is written 5 cts., 5 c., or \$.05.

2. How many cents in a dime?
3. What is the largest silver coin in our money?
4. One dollar is written \$ 1.00.
5. Ten cents is written \$.10, or 10 c., or 10 cts.
6. How many dimes in a dollar? How many cents in a dollar?
7. If I have one dollar in dimes and spend two of them, how many have I left?
If I spend three, how many dimes are left?
How many cents are spent if I spend four dimes?
Eight dimes?
If I spend fifty cents, how many dimes are left?
8. If I have one dollar and one dime, how many dimes have I? How many dollars and cents have I?

When we write dollars and cents, we place the dollar mark (\$) before the number of dollars, and place a period (.) between the dollars and the number of cents. This period is called a **Decimal Point**.

EXERCISE 54.—WRITTEN

Write in figures:

One dollar, five dollars, seven dollars, one dollar and one dime, one dollar and three dimes, three dollars and one dime, one dollar and one nickel, one dollar and two dimes and one nickel, two dollars and two dimes and two cents.

EXERCISE 55.—ORAL**MAKING CHANGE**

1. How many pieces of silver money are in common use?
2. How many pieces not silver are in use?
3. How many cents in a nickel? Two nickels? Three nickels? Five nickels?
4. A dime contains how many cents? Three dimes? Five dimes? Ten dimes?
5. How many cents in a quarter? In two quarters? In four quarters?
6. How many cents in a half dollar? In two half dollars? In four half dollars?

7. If a top costs a nickel and three cents, how many cents does it cost?

8. How much change from a dime shall I receive after paying for the top?



Change the following pieces of money :

9. A quarter, using 3 pieces.
10. A half dollar, using 2 pieces.
11. A dollar, using 2 pieces.
12. A quarter, using 5 pieces.
13. A dollar, using 4 pieces.
14. A half dollar, using 5 pieces.
15. A half dollar, using 4 pieces.
16. A half dollar, using 6 pieces.
17. A dollar, using 3 pieces.
18. A dollar, using 5 pieces.

EXERCISE 56. — ORAL

The price of certain articles and the money paid for each are given below ; make change, using as few pieces *as possible* in each problem.

	PRICE	MONEY PAID
1. Base ball	40 cents	50 cents
Bat	25 cents	50 cents
Mask	35 cents	50 cents
Protector	\$1.10	\$1.25
Catcher's mitt	68 cents	\$1.
Fielder's glove	35 cents	50 cents

	COST	MONEY PAID
2. Tennis racket	\$2.25	\$3.
Racket cover	35 cents	50 cents
Tennis balls	54 cents	\$1.
Croquet set	80 cents	\$1.
Roller skates	60 cents	\$1.

EXERCISE 57.—WRITTEN

1. Copy and make change in the following problems :

PRICE	MONEY PAID	CHANGE
15 cents	25 cents	
34	50	
19	25	
4	50	
32	25	
16	25	

2. Copy and write the sums under each :

\$12	\$3.10	16 cents	18 cents	\$2.05
<u>11</u>	<u>2.10</u>	<u>2</u>	<u>1</u>	<u>3.01</u>

3. Copy and write the difference under each :

25 cents	54 cents	29 cents	75 cents	68 cents
<u>14</u>	<u>12</u>	<u>18</u>	<u>25</u>	<u>17</u>

READING NUMBERS

EXERCISE 58.—ORAL

1. Count from 10 to 100 by 10's.
2. What is the sum of 10 and 4? 100 and 4? 100 and 14? 70 and 5? 200 and 70? 300 and 70 and 5?
3. Read these numbers: 375, 476, 875, 936, 645.
4. What is the sum of 40 and 5? 100 and 40 and 5?
5. Read these numbers: 45, 145, 575, 678, 225, 350.
6. Find page 157 in this book. Which figure stands for hundreds? Which figure stands for tens? Which for units?
7. Read the following and tell the units, tens, and hundreds in each of the following numbers:

456	987	234	543
542	378	953	597
824	385	298	569

EXERCISE 59.—WRITTEN

1. Express in figures:
4 hundred 2 tens 4 units, 5 hundred 9 tens 3 units,
9 hundred 0 tens 6 units, 7 hundred 2 tens 5 units,
8 hundred 5 tens 0 units.
2. Express in words:
10, 53, 25, 136, 275, 142, 580, 924, 276, 572, 976,
831, 502.

ADDITION

EXERCISE 60. — WRITTEN

1. 115 boys 2. 103 books 3. 113 bushels corn

124

224

123

325

323

213

123

203

223

312

114

213

4. 304 pounds meat

5. 423 pounds cotton

124

321

214

311

103

122

131

222

6. 125

7. 214

8. 144

9. 153

10. 247

213

131

421

322

101

273

167

142

277

177

232

265

343

174

342

245

453

233

353

165

11. 324

12. 23

13. 21

14. 31

15. 21

203

42

34

42

45

324

35

25

35

36

521

13

32

63

22

312

21

45

41

31

242

41

63

22

21

16.	42	17.	74	18.	24	19.	42	20.	35
	76		74		87		64		15
	58		56		75		86		66
	64		34		38		24		84
	32		67		27		46		26
	<u>12</u>		<u>37</u>		<u>42</u>		<u>62</u>		<u>85</u>
21.	42	22.	27	23.	84	24.	51	25.	41
	64		73		28		29		24
	96		96		92		43		32
	14		44		18		73		26
	45		76		84		42		43
	<u>74</u>		<u>37</u>		<u>65</u>		<u>21</u>		<u>23</u>
26.	421	27.	326	28.	122	29.	231	30.	446
	742		644		236		448		477
	343		466		958		212		473
	725		643		154		636		365
	242		262		932		374		372
	<u>333</u>		<u>241</u>		<u>722</u>		<u>154</u>		<u>157</u>
31.	682	32.	824	33.	464	34.	195	35.	116
	826		422		484		873		382
	428		486		246		466		787
	424		648		826		284		347
	637		879		468		196		785
	<u>467</u>		<u>549</u>		<u>138</u>		<u>766</u>		<u>955</u>

REVIEW OF COMBINATIONS IN ADDITION

The following table contains all of the possible groups of two figures that may occur in addition. These combinations should be known perfectly. A paper chart containing them might be put on the wall and used in frequent drills until the sum of any combination is known at a glance. Pupils should be required to use the table given below for the purpose of drill. The teacher may require a pupil to name the sums of the combinations beginning at the left and continuing to the right as far as desired, and then have another pupil begin where the first one left off.

TABLE OF COMBINATIONS IN ADDITION

2	1	7	5	1	6	1	2	4	6	3	3	8
3	5	2	4	1	3	9	5	1	4	1	3	1
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
4	2	4	8	6	5	4	7	2	5	7	2	
2	1	3	3	1	3	4	1	2	5	3	6	
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
6	5	2	6	4			6	7	5	4	3	
6	8	9	7	8			5	8	9	7	9	
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
4	8	5	8	7	3	9	7	8	9			
9	8	7	6	9	8	9	7	9	6			
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

COOKING VEGETABLES

EXERCISE 61.—ORAL

1. A small head of cabbage should be cut into pieces and soaked in cold water for 30 minutes, then put into boiling water and boiled for 40 minutes before it is ready



to be eaten. When should you begin to prepare the cabbage in order to have it ready for a one o'clock dinner?

2. A cauliflower should be soaked in cold water for an hour and then boiled for half an hour before it is ready to be eaten. If dinner is to be served at one o'clock, when should you begin to prepare the cauliflower for dinner?

3. To boil medium-size potatoes requires about 30 minutes; to bake them requires about 50 minutes. How much longer is required to bake than to boil potatoes?

4. Tomatoes should be boiled slowly for 20 minutes. Green corn, on the cob, if dropped into boiling water, should be boiled for 12 minutes. Which of the two vegetables requires the longer time to cook? How much longer?

COOKING MEATS

EXERCISE 62.—ORAL

NOTE. Meats lose weight in cooking. There are 16 ounces in 1 pound.

1. In roasting 4 pounds of meat 1 pound and 5 ounces are lost. How many ounces are lost?

2. This same piece of meat will lose 1 pound and 3 ounces in baking. How many ounces will be lost in baking?



3. This piece of beef will lose 1 pound in boiling. How much more is lost by roasting than by boiling? How much more by baking than by boiling?

4. In which is there less loss, in baking or roasting? How much less?

5. In roasting 4 pounds of mutton there is a loss of 1 pound and 6 ounces. How many ounces are lost?

6. In baking this piece of mutton 1 pound and 4 ounces are lost. How many ounces are lost?

7. In boiling this piece of mutton 14 ounces are lost. How much more is lost in roasting than in boiling?

8. How much more is lost in baking than in boiling? How much more in roasting than in baking?

THE NUMBER OF TEETH IN MAN AND SOME LOWER ANIMALS

EXERCISE 63.— ORAL

1. Children have 4 cutting teeth, 2 eye teeth, and 4 grinding teeth in each jaw. How many teeth in each jaw? How many in both jaws?

2. Grown people have 4 cutting teeth, 2 eye teeth, and 10 grinding teeth in each jaw. How many do they have in each jaw? In both jaws?

3. The dog has in the upper jaw 6 cutting teeth, 2 long tearing teeth, and 12 grinding teeth. How many teeth has he in his upper jaw?

In the lower jaw the dog has 14 grinding teeth, 6 cutting teeth, and 2 tearing teeth. How many teeth has he in the lower jaw?

4. In the upper jaw of a rabbit there are 4 cutting teeth and 12 grinding teeth. How many in all?

In the lower jaw there are 2 cutting teeth and 10 grinding teeth. How many teeth are there in the lower jaw? How many in both jaws?

5. The cow has only 12 grinding teeth in the upper jaw; in the lower jaw she has 12 grinders and 8 cutting teeth. How many teeth has she in both jaws?

6. The squirrel has 10 grinding teeth in the upper jaw and 8 in the lower jaw. How many teeth in both jaws?

7. The opossum has 10 cutting teeth, 2 tearing teeth, and 10 grinding teeth in the upper jaw. How many are there in all?

8. In the lower jaw there are eight cutting teeth, 2 tearing teeth, and 10 grinding teeth. How many in the lower jaw? How many teeth in both jaws of the opossum?

9. How many teeth has the dog in the upper and lower jaws?

10. The cat has 6 cutting teeth, 2 tearing teeth, and 7 grinding teeth in each jaw. How many teeth has she in both jaws?

EXERCISE 64. — WRITTEN

1. Write the following numbers in columns, placing units under units, tens under tens, and hundreds under hundreds, and then add :

Two hundred, forty-seven,
One hundred, fifty-six,
One hundred, forty,
Nine hundred, three.

2. Write in figures and add :

Nine hundred, forty-four,
Seven hundred, sixty-one,
Five hundred, seventy-two,
Three hundred, forty.

3. Write in figures and add :

Seven hundred, sixty-three,
Four hundred, forty-nine,
Eight hundred, thirty-seven,
Seven hundred, twelve.

PLANTS

EXERCISE 65.—ORAL

Some seeds require a longer time to come up than others. In the following examples tell how many more



days it takes the seed of the first plant to come up than that of the second plant:

PLANT	DAYS	PLANT	DAYS
1. Beet	6	Radish	4
2. Eggplant	11	Onion	10
3. Sweet corn	8	Cabbage	6
4. Lima Bean	14	Bush Bean	8
5. Potato	20	Parsnip	14
6. Watermelon	14	Cantaloupe	12
7. Okra	18	Tomato	7
8. Celery	18	Cauliflower	8
9. Cucumber	11	Cabbage	6
10. Carrot	9	Turnip	4
11. Pepper	40	Asparagus	30
12. Pea	15	Salsify	12

SUBTRACTION

EXERCISE 66.—WRITTEN

The teacher should now explain the process of “borrowing” in subtraction. Often children are confused by too elaborate explanations. The following is offered as a *simple* method:

From 962 We see at a glance that 8 units cannot be
 Take $\begin{array}{r} 128 \\ \underline{834} \end{array}$ taken from 2 units. We may think of 6 tens
 as 5 tens and 1 ten, and then add the 1 ten, or
 10 units to the 2 units, making 12 units. We
 now say “8 units from 12 units leaves 4 units,” and then write
 4 in the units’ place.

Remembering that the 6 tens is no longer 6 tens but 5 tens,
 we say “2 tens from 5 tens leaves 3 tens,” and then write 3 in
 the tens’ place. In practice we leave off the words “units,”
 “tens,” and “hundreds,” and merely say “8 from 12 leaves 4.
 2 from 5 leaves 3. 1 from 9 leaves 8.”

Subtract the following:

	1.	2.	3.	4.
From	\$538	872 pounds	757 bushels	896 miles
Take	$\begin{array}{r} 214 \\ \underline{} \end{array}$	$\begin{array}{r} 346 \\ \underline{} \end{array}$	$\begin{array}{r} 227 \\ \underline{} \end{array}$	$\begin{array}{r} 238 \\ \underline{} \end{array}$
	5.	6.	7.	8.
From	\$648	560 yards	843 barrels	674 feet
Take	$\begin{array}{r} 219 \\ \underline{} \end{array}$	$\begin{array}{r} 225 \\ \underline{} \end{array}$	$\begin{array}{r} 317 \\ \underline{} \end{array}$	$\begin{array}{r} 347 \\ \underline{} \end{array}$

	9.	10.	11.	12.	13.	14.	15.
From	325	929	725	503	796	684	836
Take	<u>114</u>	<u>295</u>	<u>182</u>	<u>221</u>	<u>398</u>	<u>387</u>	<u>458</u>
	16.	17.	18.	19.	20.	21.	22.
From	958	762	548	237	396	911	294
Take	<u>379</u>	<u>436</u>	<u>249</u>	<u>118</u>	<u>188</u>	<u>109</u>	<u>157</u>

23. From eight hundred, twenty-seven take two hundred, sixteen.

24. From seven hundred, forty-five take two hundred, thirty-one.

25. From nine hundred, thirty-one take three hundred, eighty-six.

26. One day a merchant's receipts were \$928 and on the same day he paid bills amounting to \$439. How much did he have left from the day's receipts?

27. A steamer ran 375 miles on Monday and 288 miles on Tuesday. How many more miles did it run on Monday than on Tuesday?

28. A farmer had a farm of 160 acres. He sold 85 acres to a neighbor. How many acres did he have left?

29. A man bought a horse for \$165 and sold him for \$225. How much did he make on the trade?

30. A church that owed \$763 tried to raise the money with which to pay the debt. From the proceeds of an entertainment it received \$54; the Sunday school gave \$16, and the members gave \$384. How much did the church then have to pay on the debt? How much did it lack of being able to pay the debt?

MULTIPLICATION AND DIVISION

EXERCISE 67.—ORAL



How many shoes in the picture?
 How many pairs of shoes in the picture?
 How many times two shoes in the picture?
 How many are three times two shoes?
 How many are three times two? *

			<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>
			2	2	2	2	2	2	2	2	2
Once	2 is	. 2	<u>2</u>	2	2	2	2	2	2	2	2
Two	times 2 are	. .	<u>4</u>	2	2	2	2	2	2	2	2
Three	times 2 are	. . .	<u>6</u>	2	2	2	2	2	2	2	2
Four	times 2 are	. . .	<u>8</u>	2	2	2	2	2	2	2	2
Five	times 2 are	. . .	<u>10</u>	2	2	2	2	2	2	2	2
Six	times 2 are	. . .	<u>12</u>	2	2	2	2	2	2	2	2
Seven	times 2 are	. . .	<u>14</u>	2	2	2	2	2	2	2	2
Eight	times 2 are	. . .	<u>16</u>	2	2	2	2	2	2	2	2
Nine	times 2 are	. . .	<u>18</u>	2	2	2	2	2	2	2	2
Ten	times 2 are	. . .	<u>20</u>	2	2	2	2	2	2	2	2

Read the table at the left; as, Once 2 is 2, etc.

* In an expression like this, 3×2 , “ \times ” stands for the word “times,” and we read the expression as “Three times two.”

Call the sum of each column of 2's, beginning at the left, and tell the number of 2's it contains; as,

(a) Four, — four contains two 2's; or, Four, — there are two 2's in four.

(b) Six, — six contains three 2's; or, Six, — there are three 2's in six, etc.

EXERCISE 68. — WRITTEN

Copy and commit to memory each of these tables:

MULTIPLICATION

$1 \times 2 = 2$
$2 \times 2 = 4$
$3 \times 2 = 6$
$4 \times 2 = 8$
$5 \times 2 = 10$
$6 \times 2 = 12$
$7 \times 2 = 14$
$8 \times 2 = 16$
$9 \times 2 = 18$
$10 \times 2 = 20$

DIVISION

$2 \div 2 = 1$
$4 \div 2 = 2$
$6 \div 2 = 3$
$8 \div 2 = 4$
$10 \div 2 = 5$
$12 \div 2 = 6$
$14 \div 2 = 7$
$16 \div 2 = 8$
$18 \div 2 = 9$
$20 \div 2 = 10$

Taking one number as many times as there are units in another number is called **Multiplication**.

\times is called the **sign of multiplication**. 3×2 is read "three times two," and means that 2 is to be taken 3 times.

Finding the number of times one number contains another is called **Division**.

\div is called the **sign of division**. $6 \div 2 = 3$ is read "6 divided by 2 equals 3" and means that 6 contains 2, 3 times.

EXERCISE 69.—ORAL

1. A four-year-old child requires 2 hours more sleep daily than a nine-year-old child. How many more hours' sleep will he require in 2 days? In 4 days? In 5 days? In a week?
2. A piece of butter the size of a hen's egg weighs 2 ounces. How many ounces in 3 such pieces of butter? In 8 pieces? In 7 pieces? In 9? In 10?
3. John's school is one mile from his home. How far does he walk in going to school and back home? How many miles does he walk in going to school and back in 3 days? In a week?
4. If he walks 10 miles in going to school and back home, how many times has he been to school?
5. How many 2's in 10? 18? 12? 20? 14?
6. How much will 5 2-cent stamps cost?

EXERCISE 70.—ORAL

- How many leaves in the picture?
How many groups of three leaves each?
How many times three leaves in the picture?
How many are two times three leaves?
How many are 2 times 3?
How many are 2×3 ?

			<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>
			3	3	3	3	3	3	3	3	3
Once	3 is	. .	3	3	3	3	3	3	3	3	3
Two	times 3 are	. . .	<u>6</u>	3	3	3	3	3	3	3	3
Three	times 3 are	. . .	<u>9</u>	3	3	3	3	3	3	3	3
Four	times 3 are	. . . .	<u>12</u>	3	3	3	3	3	3	3	3
Five	times 3 are	. . . . .	<u>15</u>	3	3	3	3	3	3	3	3
Six	times 3 are	. . . . .	<u>18</u>	3	3	3	3	3	3	3	3
Seven	times 3 are	. . . . .	<u>21</u>	3	3	3	3	3	3	3	3
Eight	times 3 are	. . . . .	<u>24</u>	3	3	3	3	3	3	3	3
Nine	times 3 are	. . . . .	<u>27</u>	3	3	3	3	3	3	3	3
Ten	times 3 are	. . . . .	<u>30</u>	3	3	3	3	3	3	3	3

Read the table at the left ; as, Once 3 is 3, etc.

Call the sum of each column, beginning at the left, and tell the number of 3's it contains ; as,

(*a*) Six, — six contains two 3's ; or, Six, — there are two 3's in six.

(*b*) Nine, — nine contains three 3's ; or, Nine — there are three 3's in nine.

EXERCISE 71. — WRITTEN

Copy and commit to memory each of these tables :

MULTIPLICATION	DIVISION
$1 \times 3 = 3$	$3 \div 3 = 1$
$2 \times 3 = 6$	$6 \div 3 = 2$
$3 \times 3 = 9$	$9 \div 3 = 3$
$4 \times 3 = 12$	$12 \div 3 = 4$
$5 \times 3 = 15$	$15 \div 3 = 5$
$6 \times 3 = 18$	$18 \div 3 = 6$
$7 \times 3 = 21$	$21 \div 3 = 7$
$8 \times 3 = 24$	$24 \div 3 = 8$
$9 \times 3 = 27$	$27 \div 3 = 9$
$10 \times 3 = 30$	$30 \div 3 = 10$

EXERCISE 72.—ORAL

1. The distance around a triangle or a square is called the perimeter. What is the perimeter of a triangle each of whose sides is 3 inches long?

2. What is the perimeter of a square flower bed whose sides are 3 feet long?

3. There are 3 feet in a yard. How many feet in 2 yards? In 3 yards? In 5 yards? In 4 yards?

4. How many yards in 9 feet? 18 feet? 27 feet?

5. If one cabbage plant is set in a space of 3 feet, how many feet are required for 4 cabbage plants? For 7 plants?

6. If cucumbers are planted in hills allowing 3 feet to the hill, how many feet will 4 hills require? 9 hills?

7. Onions require 3 inches to each plant. How many onions will be planted in a space of 12 inches? In 24 inches? In 30 inches? In 21 inches?

8. How many are 4 times 3? 7 times 3? 9 times 3?

9. How many 3's in 18? 12? 30? 15?

EXERCISE 73.—ORAL

How many birds in the picture?

How many groups of four birds each in the picture?

How many times four birds in the picture?

How many are 2 times 4?

How many are 2×4 ?

			<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>
Once	4 is	. . 4	4	4	4	4	4	4	4	4	4
Two	times 4 are	. . . <u>8</u>	4	4	4	4	4	4	4	4	4
Three	times 4 are	. . . . <u>12</u>	4	4	4	4	4	4	4	4	4
Four	times 4 are	. . . . . <u>16</u>	4	4	4	4	4	4	4	4	4
Five	times 4 are	. . . . . . <u>20</u>	4	4	4	4	4	4	4	4	4
Six	times 4 are	. . . . . . . <u>24</u>	4	4	4	4	4	4	4	4	4
Seven	times 4 are	. . . . . . . . <u>28</u>	4	4	4	4	4	4	4	4	4
Eight	times 4 are	. . . . . . . . . <u>32</u>	4	4	4	4	4	4	4	4	4
Nine	times 4 are	. . . . . . . . . . <u>36</u>	4	4	4	4	4	4	4	4	4
Ten	times 4 are	. . . . . . . . . . . <u>40</u>	4	4	4	4	4	4	4	4	4

Read the table at the left; as, Once 4 is 4, etc.

Call the sum of each column, beginning at the left, and tell the number of 4's it contains; as,

(a) Eight,—eight contains two 4's; or, Eight,—there are two 4's in eight.

(b) Twelve,—twelve contains three 4's; or, Twelve,—there are three 4's in twelve.

EXERCISE 74.—WRITTEN

Copy and commit to memory each of these tables.

MULTIPLICATION

$$\begin{array}{l}
 1 \times 4 = 4 \\
 2 \times 4 = 8 \\
 3 \times 4 = 12 \\
 4 \times 4 = 16 \\
 5 \times 4 = 20 \\
 6 \times 4 = 24 \\
 7 \times 4 = 28 \\
 8 \times 4 = 32 \\
 9 \times 4 = 36 \\
 10 \times 4 = 40
 \end{array}$$

DIVISION

$$\begin{array}{l}
 4 \div 4 = 1 \\
 8 \div 4 = 2 \\
 12 \div 4 = 3 \\
 16 \div 4 = 4 \\
 20 \div 4 = 5 \\
 24 \div 4 = 6 \\
 28 \div 4 = 7 \\
 32 \div 4 = 8 \\
 36 \div 4 = 9 \\
 40 \div 4 = 10
 \end{array}$$

EXERCISE 75.—ORAL

1. If, in planting beans in a row, you allow 4 inches to each bean, how many inches will be required for 3 beans? How many for 10?
2. In one pound of flour there are 4 cupfuls. How many in 2 pounds? In 7 pounds? In 9 pounds?
3. There are four quarters in a dollar. How many quarters in 5 dollars? 8 dollars? 6 dollars?
4. How many dollars in 8 quarters? In 16 quarters? In 28 quarters? In 40 quarters?
5. If corn rows are 4 feet wide, how far will you walk in crossing directly over 6 rows?
6. How many are 3 times 4? 7 times 4? 9 times 4?
7. How many 4's in 12? In 20? In 16? In 36?
8. A merchant bought 6 bunches of bananas and paid \$4 a bunch for them. What did he pay for the bananas? What would 8 bunches cost at the same price a bunch?

EXERCISE 76.—ORAL

Which is greater, 3×2 leaves or 2×3 leaves?

Which is greater, 3×4 dots or 4×3 dots?

Which is greater, 5×2 cents or 2×5 cents?

Which is greater, 5×3 marks or 3×5 marks?

Which is greater, 5×4 marbles or 4×5 marbles?

		<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>
Once	5 is . . .	5	5	5	5	5	5	5	5	5
Two times 5 are . . .		<u>10</u>	5	5	5	5	5	5	5	5
Three times 5 are . . .			<u>15</u>	5	5	5	5	5	5	5
Four times 5 are . . .				<u>20</u>	5	5	5	5	5	5
Five times 5 are . . .					<u>25</u>	5	5	5	5	5
Six times 5 are . . .						<u>30</u>	5	5	5	5
Seven times 5 are . . .							<u>35</u>	5	5	5
Eight times 5 are . . .								<u>40</u>	5	5
Nine times 5 are . . .									<u>45</u>	5
Ten times 5 are . . .										<u>50</u>

Read the table at the left ; as, Once 5 is 5, etc.

Call the sum of each column, beginning at the left, and tell the number of 5's it contains ; as,

(*a*) Ten, — ten contains two 5's ; or, Ten, — there are two 5's in ten.

(*b*) Fifteen, — fifteen contains three 5's ; or, Fifteen, — there are three 5's in fifteen.

EXERCISE 77. — WRITTEN

Copy and commit to memory each of these tables :

MULTIPLICATION

$1 \times 5 = 5$
$2 \times 5 = 10$
$3 \times 5 = 15$
$4 \times 5 = 20$
$5 \times 5 = 25$
$6 \times 5 = 30$
$7 \times 5 = 35$
$8 \times 5 = 40$
$9 \times 5 = 45$
$10 \times 5 = 50$

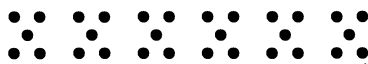
DIVISION

$5 \div 5 = 1$
$10 \div 5 = 2$
$15 \div 5 = 3$
$20 \div 5 = 4$
$25 \div 5 = 5$
$30 \div 5 = 6$
$35 \div 5 = 7$
$40 \div 5 = 8$
$45 \div 5 = 9$
$50 \div 5 = 10$

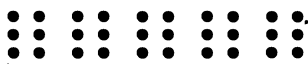
EXERCISE 78.—ORAL

1. If a family uses 5 ounces of sugar at breakfast each day, how much will be used for breakfast in 4 days? In a week?
2. If this family uses 4 ounces of sugar for dinner each day, how much will be used for dinner on Monday, Tuesday, and Wednesday?
3. 30 ounces of sugar will be enough for how many breakfasts for this family?
4. Another family uses 3 ounces of sugar for breakfast, 4 ounces for dinner, and 5 ounces for supper. How many ounces are used for a week's breakfasts?
5. How many ounces for a week's suppers? For a week's dinners?
6. How many ounces are used by this family for all of the meals during a week?
7. A family uses 5 ounces of bread at breakfast. For how many breakfasts will 20 ounces be sufficient? 25 ounces? 40 ounces? 15 ounces?
8. How many are 6 times 5? 8 times 5? 9 times 5?
9. How many 5's in 35? 25? 45? 30?

EXERCISE 79.—ORAL



$$6 \times 5$$



$$5 \times 6$$

How many are 6×5 ? 5×6 ?

Which is greater, 6×5 or 5×6 ?

Which is greater, 6×2 or 2×6 ?

Count by 6's to 30; to 48; to 60.

How many are 6×3 ? 3×6 ?

How many are 6×4 ? 4×6 ?

			<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>
			6	6	6	6	6	6	6	6	6
Once	6 is	. .	6	<u>6</u>	6	6	6	6	6	6	6
Two	times 6 are	. . .	<u>12</u>	<u>6</u>	6	6	6	6	6	6	6
Three	times 6 are	. . .	. .	<u>18</u>	<u>6</u>	6	6	6	6	6	6
Four	times 6 are	. . .	. . .	. .	<u>24</u>	<u>6</u>	6	6	6	6	6
Five	times 6 are	. . .	. . . .	. . .	<u>30</u>	<u>6</u>	6	6	6	6	6
Six	times 6 are	. . .	. . . . .	. . . .	<u>36</u>	<u>6</u>	6	6	6	6	6
Seven	times 6 are	. . .	. . . . .	. . . . .	. . .	<u>42</u>	<u>6</u>	6	6	6	6
Eight	times 6 are	. . .	. . . . .	. . . . .	. . . .	. . .	<u>48</u>	<u>6</u>	6	6	6
Nine	times 6 are	. . .	. . . . .	. . . . .	. . . . .	. . . .	. . .	<u>54</u>	<u>6</u>	6	6
Ten	times 6 are	. . .	. . . . .	. . . . .	. . . . .	. . . . .	. . . .	. . .	<u>60</u>	6	6

Read the table at the left ; as, Once 6 is 6, etc.

Call the sum of each column, beginning at the left, and tell the number of 6's it contains ; as,

(a) Twelve,—twelve contains two 6's ; or, Twelve,—there are two 6's in twelve.

(b) Eighteen,—eighteen contains three 6's ; or, Eighteen,—there are three 6's in eighteen.

EXERCISE 80.—WRITTEN

Copy and commit to memory each of these tables :

MULTIPLICATION

$1 \times 6 = 6$
$2 \times 6 = 12$
$3 \times 6 = 18$
$4 \times 6 = 24$
$5 \times 6 = 30$
$6 \times 6 = 36$
$7 \times 6 = 42$
$8 \times 6 = 48$
$9 \times 6 = 54$
$10 \times 6 = 60$

DIVISION

$6 \div 6 = 1$
$12 \div 6 = 2$
$18 \div 6 = 3$
$24 \div 6 = 4$
$30 \div 6 = 5$
$36 \div 6 = 6$
$42 \div 6 = 7$
$48 \div 6 = 8$
$54 \div 6 = 9$
$60 \div 6 = 10$

EXERCISE 81. — ORAL

1. School begins at 9 o'clock in the morning and closes at 3 o'clock in the afternoon. How many hours is the school in session daily?

2. During how many hours are the pupils in this school on Monday and Tuesday? How many hours during the week?

3. How many copy books can I buy for 30 cents if the books cost 6 cents apiece?

4. I saw 4 wagons in a circus parade and each wagon was drawn by 6 horses. How many horses were drawing the four wagons?

5. John was a pupil in the school spoken of in the first of these examples. He was absent every day of one week and also absent on Monday, Tuesday, and Wednesday of the following week. How many hours did he lose from school?

6. A farmer divided a 42-acre field into smaller fields, each of which contained 6 acres apiece. How many of the smaller fields were there?

7. How many are 3 times 6? 5 times 6? 8 times 6?

8. How many 6's in 24? 36? 54?

9. How many are 4 times 2 dollars? 5 times 3 flowers? 6 times 4 boys? 4 times 6 houses?

10. How much must be paid for three five-cent packages of soda?

11. During a match game of ball, the pitcher of one of the teams struck out 3 men 4 times. How many did he strike out in all?

ADDITION OF UNITED STATES MONEY

EXERCISE 82. — Oral

The articles in the following problems were bought by a camping party during a few weeks' outing.



1. One pound of tea, 50 cents ; 20 pounds of sugar, \$1.00. What was the cost?

2. Three pounds of coffee, 85 cents ; 1 package of salt, 10 cents. What was the cost?

3. Four pounds of pancake flour, 20 cents ; a sack of pastry flour, 75 cents. What was the cost?

4. Three pounds of rice, 25 cents ; 1 package of tapioca, 15 cents ; 1 package of corn starch, 10 cents. What was the cost?

5. One package of soda, 5 cents ; 1 package of cream of tartar, 5 cents ; 1 package of baking powder, 25 cents ; 1 box of pepper, 10 cents. What was the cost?

6. One package of macaroni, 18 cents ; 4 packages of breakfast food, 50 cents. What was the cost?

7. Two cans of corn, 24 cents ; 2 cans of peas, 24 cents. What was the cost?

8. Two cans of tomatoes, 24 cents ; 2 cans of sliced beef, 30 cents. What was the cost ?

9. Two cans of salmon, 24 cents ; 2 bottles of pickles, 50 cents. What was the cost ?

10. Two pounds of prunes, 20 cents ; 1 pound of apricots, 18 cents. What was the cost ?

11. One pound of raisins, 12 cents ; 1 pound of currants, 12 cents. What was the cost ?

12. One package of chocolate, 15 cents ; 1 package of cocoa, 25 cents. What was the cost ?

13. Ground cinnamon, 5 cents ; mace, 5 cents ; nutmeg, 5 cents ; cloves, 5 cents ; vanilla, 15 cents. What was the cost ?

14. A ham, \$1.50 ; 5 pounds of bacon, 85 cents. What was the cost ?

15. One can of mustard, 15 cents ; 1 quart of vinegar, 15 cents ; 1 dozen lemons, 30 cents. What was the cost ?

16. One package of crackers, 75 cents ; 2 pounds of cheese, 40 cents. What was the cost ?

17. 6 bars of laundry soap, 25 cents ; bluing, 3 cents ; laundry starch, 10 cents. What was the cost ?

18. Twelve cans of sweet potatoes, \$1.20 ; twelve cans of string beans, \$1.20 ; four bottles of olives, \$1.70. What was the cost ?

19. Six cans of boneless chicken, \$2.40 ; six bottles of salad dressing, \$1.50. What was the cost ?

20. One dozen towels, \$1.75 ; two dozen table napkins, \$1.50. What was the cost ?

EXERCISE 83. — WRITTEN

To add United States Money, write the dollars and cents in columns so that the dollars will come directly under the dollars, and the cents directly under the cents, with all of the periods in the same vertical line. Begin at the right and add as in other numbers.

$$\begin{array}{r} 1. \text{ Add } \$2.40 \text{ and } \$.75. \quad \$2.40 \\ \quad \quad \quad .75 \\ \hline \quad \quad \quad \$3.15 \end{array}$$

2. What was the cost of the tea, sugar, and coffee in Exercise 82?

3. Find the cost of all the canned vegetables; of the dried fruits.

4. What was the cost of the meats? Of the spices?

5. What was the cost of all the foods made from grain? Of the laundry articles?

6. What was the total weight of the tea, sugar, coffee, pan-cake flour, rice, prunes, raisins, currants, and bacon that was bought by the party?

7. The party paid \$24.25 for railroad tickets, \$7.25 for freight, and \$1.75 for drayage. How much was paid in all for the tickets, freight, and drayage?

8. The farmer on whose land the party camped had two horses, one of which cost \$215 and the other \$185, a double set of wagon harness that cost \$25, and a wagon that cost \$85. What was the total cost of horses, harness, and wagon?

SUBTRACTION OF UNITED STATES MONEY

EXERCISE 84.—ORAL



The following books, when bought by school libraries, cost less than when bought by individual buyers. Find the difference in price to libraries and individuals.

	TO INDIVIDUALS	TO LIBRARIES
1. Little Folks down South	\$1.25	\$1.18
2. Æsop's Fables	.35	.29
3. Alice's Adventures in Wonderland	.50	.40
4. Fairy Tales in Prose and Verse	.50	.44
5. Christmas in Other Lands	.05	.05
6. Fifty Famous Stories Retold	.35	.29
7. Legends of the Red Children	.30	.25
8. Hans Andersen's Best Stories	.20	.18
9. Robinson Crusoe	.30	.22

	TO INDIVIDUALS	TO LIBRARIES
10. All the Year Round	\$.30	\$.25
11. Stories of Garden and Field	.40	.32
12. Bird World	.60	.49
13. Seven Little Sisters	.50	.41
14. Seed Travelers	.25	.21
15. American Stories for American Children	.35	.29
16. Stories of Great Inventors	.40	.32
17. Colonial Children	.40	.35
18. Stories of Heroic Deeds	.30	.25
19. De Soto, Marquette, and La Salle	.50	.40
20. Story of H. W. Longfellow	.05	.05
21. Story of Washington	.25	.21

EXERCISE 85.—WRITTEN

In finding the answers to the following problems, look at the prices given above.

1. The first nine books are stories from literature. What is the cost of these books to an individual buyer?
2. What would be the cost of these books when bought by a library?
3. What is the difference in cost to the individual and to the library?
4. From 10 to 14, both included, are Nature Stories. What is the difference between their cost to an individual and to a library?
5. The remaining six books are History Stories. How much less would they cost when bought by a library than if bought by an individual?

FRACTIONS

EXERCISE 86. — ORAL

1. If anything is divided into two equal parts, what is one of them called?

2. If it is divided into three equal parts, what is one of them called? What is one of the parts called when it is divided into four equal parts? Into five equal parts? Into seven equal parts? What is one of the parts called when it is divided into eight equal parts? Into nine equal parts? Into ten equal parts?

One half is written $\frac{1}{2}$.

One third is written $\frac{1}{3}$.

One fourth is written $\frac{1}{4}$.

One fifth is written $\frac{1}{5}$.

The upper and lower figures of a fraction are called **the terms of the fraction**.

The lower figure of a fraction tells the name of the parts into which anything is divided, and is called **the denominator**.

The upper figure of a fraction tells how many of the equal parts are meant, and is called **the numerator**.

3. A boy spent $\frac{2}{4}$ of his money for a top and $\frac{1}{4}$ for a marble. What part of his money did he spend?

4. A farmer sold $\frac{2}{6}$ of his farm to one man and $\frac{1}{6}$ of it to another. How much of his farm did he sell to both?

5. How do you find the sum of two fractions when their names, or denominators, are alike?

HALVES AND THIRDS OF NUMBERS

EXERCISE 87.—ORAL

1. If you have two cents and spend one cent, what part of your money do you spend? 1 is what part of 2?
2. If you have four cents and spend two cents, what part of your money do you spend? 2 is what part of 4?
3. If you have six cents and spend three cents, what part of your money do you spend? How many 3's make 6? 3 is what part of 6?
4. There are eight acres in a field. Four acres are planted in corn and four in cotton. What part of the field is planted in corn? What part in cotton?
5. How many 4's in 8? 4 is what part of 8?
6. I have a nickel and five one-cent pieces. How much money have I?
7. The nickel is what part of my money? What part are the five one-cent pieces? Five cents are what part of ten cents? 5 is what part of 10?
8. If you have three cents and spend one cent, what part of your money do you spend? 1 is what part of 3?
9. Count by 2's to 6. How many 2's make 6? If I have 6 cents and give 2 cents for a stamp, what part of my money do I give for the stamp? 2 cents is what part of 6 cents?

10. Count by 3's to 9. How many 3's make 9? 3 is what part of 9?

11. Count by 4's to 12. How many 4's make 12? How many 4's in 12?

12. 4 is what part of 12? 8 is what part of 12?

13. How much is 12 and $\frac{1}{3}$ of 12?

14. How much is 12 and $\frac{2}{3}$ of 12?

15. 3 is what part of 9? How much is 9 and $\frac{1}{3}$ of 9?

16. 6 is what part of 9? How much is 9 and $\frac{2}{3}$ of 9?

17. 5 is what part of 15? How much is 15 and $\frac{1}{3}$ of 15?

18. 10 is what part of 15? How much is 15 and $\frac{2}{3}$ of 15?

19. What is $\frac{1}{2}$ of 12? How much is 12 and $\frac{1}{2}$ of 12?

20. What is $\frac{1}{3}$ of 18? How much is 18 and $\frac{1}{2}$ of 18?

21. What is $\frac{1}{2}$ of 14? How much is 14 and $\frac{1}{2}$ of 14?

22. What is $\frac{1}{2}$ of 8? How much is 8 and $\frac{1}{2}$ of 8?

23. What is $\frac{1}{2}$ of 2? How much is 2 and $\frac{1}{2}$ of 2?

24. What is $\frac{1}{3}$ of 3? How much is 3 and $\frac{1}{3}$ of 3?

25. What is $\frac{1}{2}$ of 6? How much is 6 and $\frac{1}{2}$ of 6?

26. What is $\frac{1}{3}$ of 6? How much is 6 and $\frac{1}{3}$ of 6?

27. If you buy land for \$15 an acre and sell it to Mr. Brown for $\frac{1}{3}$ more per acre than it cost, what does Mr. Brown pay you for an acre?

28. If Mr. Brown sells the same land to Mr. Smith for $\frac{1}{4}$ more per acre than he paid for it, how much does Mr. Smith pay for an acre?

FOURTHS AND FIFTHS OF NUMBERS

EXERCISE 88.—ORAL

1. If you have four cents and spend one cent, what part of your money do you spend? 1 is what part of 4?

2. If you have 8 cents and give 2 cents for a pencil, what part of your money do you give for the pencil?

3. A boy had to solve 16 examples in arithmetic. After solving all but four, what part of the lesson still remained unsolved?

4. A postal card costs what part of a nickel?

5. A nickel is what part of 20 cents?

6. Count by 6's to 24. 6 is what part of 24?

7. A two-cent stamp costs what part of a dime?

8. A nickel is what part of a quarter of a dollar?

9. How many 5's make 25? 5 is what part of 25?

10. How many 6's make 30? 6 is what part of 30?

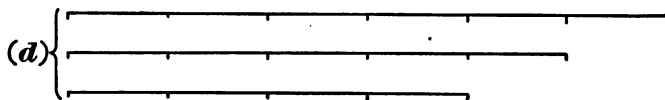
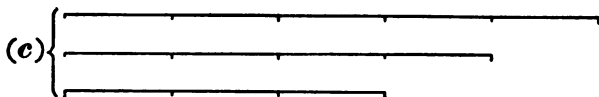
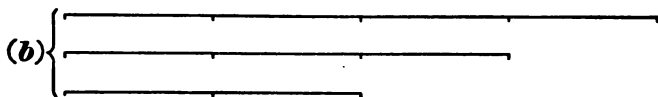
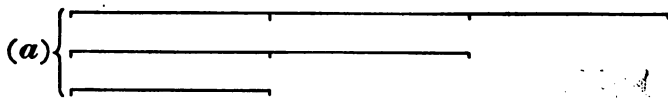
11. What is one half of 12? 14? 16? 18? 20?

12. What is one third of 12? 15? 18? 21? 24? 27? 30?

13. What is one fourth of 12? 16? 20? 24? 28? 32? 36? 40?

14. What is one fifth of 15? 20? 25? 30? 35? 40? 45? 50?

EXERCISE 89. — ORAL



1. Look at the upper, lower, and middle line in group (a) and answer each of the following questions:

The upper line is how much longer than the middle line?

(Answer: The upper line is $\frac{1}{2}$ longer than the middle line.)

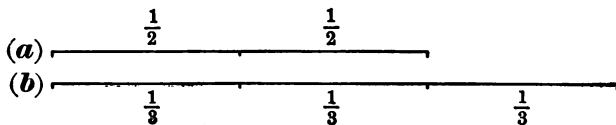
The lower line is how much shorter than the middle line?

(Answer: The lower line is $\frac{1}{2}$ shorter than the middle line.)

2. Ask the same questions about group (b).
3. Ask the same questions about group (c).
4. Ask the same questions about group (d).

EXERCISE 90. — WRITTEN

1. Draw a horizontal line of any length (see Fig. *a*), divide it into two equal parts, and then draw another line



directly under the first line of such length that $\frac{1}{2}$ of the upper line shall equal $\frac{1}{3}$ of the lower line.

In the same way draw two lines of such length that

2. $\frac{1}{3}$ of the upper line shall equal $\frac{1}{4}$ of the lower line.
3. $\frac{1}{4}$ of the upper line shall equal $\frac{1}{5}$ of the lower line.
4. $\frac{1}{5}$ of the upper line shall equal $\frac{1}{6}$ of the lower line.
5. $\frac{2}{5}$ of the upper line shall equal $\frac{2}{5}$ of the lower line.
6. $\frac{3}{5}$ of the upper line shall equal $\frac{1}{2}$ of the lower line.
7. $\frac{4}{5}$ of the upper line shall equal $\frac{1}{3}$ of the lower line.
8. $\frac{1}{5}$ of the upper line shall equal $\frac{1}{6}$ of the lower line.

After the above lines have been drawn, ask the following questions about each two lines:

The lower line is how much longer than the upper line?

The upper line is how much shorter than the lower line?

NOTE. When percentage is being studied, turn back to Exercise 89, review it, and then ask the same questions once more, but substitute the words "what per cent" for "how much." Follow the same plan with a review of Exercise 90.

EXERCISE 91.—WRITTEN

Draw seven horizontal lines :

- (1) The first line is $\frac{1}{3}$ shorter than I wish.
- (2) The second is $\frac{1}{4}$ shorter than I wish.
- (3) The third is $\frac{1}{5}$ shorter than I wish.
- (4) The fourth is $\frac{1}{6}$ shorter than I wish.
- (5) The fifth is $\frac{2}{3}$ shorter than I wish.
- (6) The sixth is $\frac{2}{5}$ shorter than I wish.
- (7) The seventh is $\frac{2}{3}$ shorter than I wish.

Make each line the length I wish, using the illustration for (1) as a model.

EXPLANATION

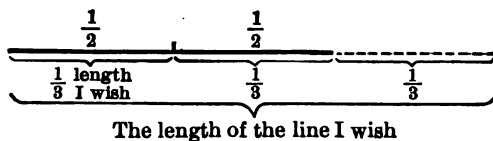
The line is drawn $\frac{1}{3}$ shorter than I wish.

It is only $\frac{2}{3}$ of the length I wish.

$\frac{1}{3}$ of it is $\frac{1}{3}$ of the length I wish.

$\frac{2}{3}$ of it is $\frac{2}{3}$ of the length I wish.

ILLUSTRATION



Copy the illustration, drawing first the line, and then the longer line.

Next, substitute “longer” for “shorter” in each of the above examples and make each line the length I wish, using the illustration for (1) as a model.

EXPLANATION

The line is drawn $\frac{1}{3}$ longer than I wish.

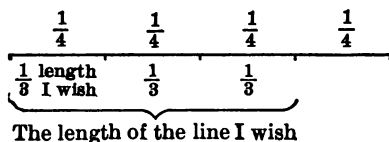
It is $\frac{4}{3}$ of the length I wish.

$\frac{1}{4}$ of it is $\frac{1}{3}$ of the length I wish.

$\frac{3}{4}$ of it are $\frac{2}{3}$ of the length I wish.

Copy the illustration, drawing first the line, and then the shorter line.

ILLUSTRATION



1. If you buy a farm and add to it land $\frac{1}{3}$ of its size, and then sell $\frac{1}{4}$ of this new farm to a neighbor, is that which remains larger or smaller than your farm was at first?

NOTE. Draw a square to stand for the farm. Divide it into thirds by vertical lines. Add another third at the side of the square. Mark off $\frac{1}{4}$ of what you now have, etc.

2. Draw a square and let it stand for a man's money. Divide it by vertical lines into fourths, and add one fourth to show what he makes the first year he is in business. Cross out $\frac{2}{3}$ of what he now has as the loss during the second year. That which now remains stands for what he has left at the end of the second year. Add $\frac{1}{3}$ of what he has at the end of the second year as the profit during the third year, and then tell how much more or less he now has than he had at first.

MEASURES OF LENGTH

TABLE

12 inches (in.) make 1 foot (ft.)

3 feet make 1 yard (yd.)

EXERCISE 92. — ORAL

D _____

C _____

B _____

A _____

1 inch

1. How long is line *A*? *B*? *C*? *D*?
2. Line *D* equals what part of line *B*?
3. Line *D* equals what part of line *C*?
4. How many inches in a line twice as long as the line *A*? In a line three times as long as the line *A*?
5. What name is generally given to a line 12 inches long?
6. Line *A* equals what part of 12 inches?
7. Line *B* equals what part of 12 inches?
8. Line *D* equals what part of 12 inches?
9. Lines *A* and *B* are together equal to what part of 12 inches?

10. Lines *C* and *D* are together equal to what part of 12 inches?

11. What name is given sometimes to a line three feet long?

12. $\frac{1}{2}$ of line *A* equals how many inches?

13. $\frac{1}{2}$ of line *B* equals how many inches?

14. $\frac{1}{2}$ of line *C* equals how many inches?

15. $\frac{1}{3}$ of line *C* equals how many inches?

16. $\frac{1}{2}$ of 4 inches are how many inches?

17. $\frac{1}{3}$ of 3 inches are how many inches?

18. $\frac{1}{2}$ of 2 inches are how many inches?

19. $\frac{1}{2}$ of 12 inches are how many inches?

20. $\frac{1}{3}$ of 12 inches are how many inches?

21. How many inches are $\frac{1}{4}$ of 12 inches?

22. How many inches in $\frac{1}{2}$ of a foot?

23. How many feet in $\frac{1}{3}$ of a yard?

24. How many inches in $\frac{1}{4}$ of a foot?

25. How many feet in $\frac{2}{3}$ of a yard?


26. How many inches in $\frac{1}{3}$ of a yard? In $\frac{2}{3}$ of a yard?

27. How many inches in a foot? In 2 feet? In 3 feet? In one yard?

28. Lines *A*, *B*, and *C* are together equal to what part of a foot?

29. Lines *B*, *C*, and *D* are together equal to what part of a foot?

30. Lines *B* and *D* are together equal to what part of a foot?



REVIEW

EXERCISE 93.—ORAL

1. If a certain family uses one pound (16 ounces) of bread for breakfast, and 12 ounces for dinner, how much is used for the two meals?

2. For supper they have rolls made of 12 ounces of flour, 2 ounces of eggs, and 1 ounce of butter. How many ounces are used in making the rolls?

3. How many more ounces of bread are used for breakfast than for supper? How many more ounces for supper than for dinner?

4. How many more ounces are used in a week for breakfasts than for suppers?

5. How many more ounces are used in a week for suppers than for dinners?

6. For breakfast a family uses 10 ounces of meat, and for supper the same quantity. How many ounces are used for both meals?

7. For dinner this family uses 2 pounds of meat. How many ounces?

8. How many pounds will be needed for a week's dinners?

9. How many more ounces does this family use for dinner than for breakfast?

10. A bread pudding for this family required 4 ounces of bread, 1 pound and 8 ounces of milk, 2 ounces of eggs, and 1 ounce of butter. How many ounces of food were used in making the pudding?

EXERCISE 94.—WRITTEN

Find the sum of:

1. 354	2. 765	3. 258	4. 492	5. 235	6. 246
267	864	265	368	346	864
273	278	382	875	457	357
482	642	864	542	568	246
<u>305</u>	<u>341</u>	<u>650</u>	<u>504</u>	<u>679</u>	<u>359</u>

EXERCISE 95.—WRITTEN

Find the sum of:

1. 125	2. 243	3. 425	4. 456	5. 231	6. 721
246	194	198	594	426	342
347	256	234	287	542	563
142	234	456	414	753	427
236	457	121	232	625	852
<u>525</u>	<u>123</u>	<u>437</u>	<u>121</u>	<u>242</u>	<u>322</u>

EXERCISE 96.—WRITTEN

Find the sum of:

1. 456	2. 267	3. 264	4. 647	5. 735	6. 657
426	715	324	777	457	747
435	632	241	277	777	777
457	533	163	567	574	771
<u>654</u>	<u>534</u>	<u>262</u>	<u>717</u>	<u>273</u>	<u>262</u>

EXERCISE 97.—WRITTEN

Find the sum of:

1. 777	2. 777	3. 277	4. 767	5. 157	6. 775
643	277	677	732	777	678
734	779	395	778	277	357
777	673	213	873	677	742
<u>657</u>	<u>262</u>	<u>844</u>	<u>475</u>	<u>377</u>	<u>537</u>

MULTIPLICATION AND DIVISION

EXERCISE 98.—ORAL

Count by 7's to 21; 35; 49; 63.

		<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>
		7	7	7	7	7	7	7	7	7
Once	7 is	7	<u>7</u>	7	7	7	7	7	7	7
Two	times 7 are	.	<u>14</u>	7	7	7	7	7	7	7
Three	times 7 are	.	.	<u>21</u>	7	7	7	7	7	7
Four	times 7 are	.	.	.	<u>28</u>	7	7	7	7	7
Five	times 7 are	.	.	.	.	<u>35</u>	7	7	7	7
Six	times 7 are	.	.	.	.	.	<u>42</u>	7	7	7
Seven	times 7 are	.	.	.	.	.	.	<u>49</u>	7	7
Eight	times 7 are	.	.	.	.	.	.	.	<u>56</u>	7
Nine	times 7 are	.	.	.	.	.	.	.	.	<u>63</u>
Ten	times 7 are	.	.	.	.	.	.	.	.	<u>70</u>

Read the table at the left; as, Once 7 is 7, etc.

How many times 7 is 14? 21? 28? 35? 42? 49?
56? 63? 70? as, Two times 7 are 14, etc.

How many 7's are there in 14? 21? 28? 35? 42?
49? 56? 63? 70?

How many 7's in 14? One 7 is what part of 14?

How many 7's in 21? One 7 is what part of 21?

What is the sum of three 7's? Seven 7's? Five 7's?

What is the sum of six 7's, and 7? How many 7's in 49?

What is the sum of seven 7's, and 7? How many 7's in 56?

How many are 8 times 7, and 7? How many 7's in 63?

How many are 3 times 7, and 7? How many 7's in 28?

EXERCISE 99.—WRITTEN

Copy and commit to memory each of these tables :

MULTIPLICATION

$1 \times 7 = 7$

$2 \times 7 = 14$

$3 \times 7 = 21$

$4 \times 7 = 28$

$5 \times 7 = 35$

$6 \times 7 = 42$

$7 \times 7 = 49$

$8 \times 7 = 56$

$9 \times 7 = 63$

$10 \times 7 = 70$

DIVISION

$7 \div 7 = 1$

$14 \div 7 = 2$

$21 \div 7 = 3$

$28 \div 7 = 4$

$35 \div 7 = 5$

$42 \div 7 = 6$

$49 \div 7 = 7$

$56 \div 7 = 8$

$63 \div 7 = 9$

$70 \div 7 = 10$

EXERCISE 100.—ORAL

1. Jane is 7 years old. Her mother is 5 times as old. How old is her mother?

2. Her father is 6 times as old as Jane. How old is he?

3. How many pounds of seed corn are required to plant 9 acres, if 7 pounds are required for 1 acre?

4. How many acres may be planted with 56 pounds of corn?

5. How many days in 5 weeks? In 7 weeks? In 9 weeks?

6. A man was sick with fever for 28 days. How many weeks had he the fever?

7. How much is 3 times 7? 7 times 7? 10 times 7? 9 times 7?

8. How many 7's in 14? 28? 70? 35? 63?

EXERCISE 101.—WRITTEN

Find the sum of :

1. 686	2. 858	3. 888	4. 863	5. 888	6. 858
888	881	424	882	888	888
848	883	888	888	884	288
884	888	828	888	888	628
288	138	181	888	888	868
<u>248</u>	<u>428</u>	<u>457</u>	<u>458</u>	<u>468</u>	<u>548</u>

EXERCISE 102.—ORAL

Count by 8's to 24; 40; 56; 64; 80.

	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>
	8	8	8	8	8	8	8	8	8
Once 8 is	. 8	8	8	8	8	8	8	8	8
Two times 8 are	. 16	8	8	8	8	8	8	8	8
Three times 8 are	. .	24	8	8	8	8	8	8	8
Four times 8 are	. . .	32	8	8	8	8	8	8	8
Five times 8 are	. . . .	40	8	8	8	8	8	8	8
Six times 8 are	. . . . .	48	8	8	8	8	8	8	8
Seven times 8 are	. . . . .	56	8	8	8	8	8	8	8
Eight times 8 are	. . . . .	64	8	8	8	8	8	8	8
Nine times 8 are	. . . . .	72	8	8	8	8	8	8	8
Ten times 8 are	. . . . .	80	8	8	8	8	8	8	8

Read the table at the left; as, Once 8 is 8, etc.

How many times 8 is 16? 24? 32? 40? 48? 56?
64? 72? 80? as, Two times 8 are 16, etc.

How many 8's are there in 16? 24? 32? 40? 48?
56? 64? 72? 80?

How many 8's in 16? One 8 is what part of 16?

How many 8's in 24? One 8 is what part of 24?

EXERCISE 103. — WRITTEN

Copy and commit to memory each of these tables:

MULTIPLICATION

$1 \times 8 = 8$
$2 \times 8 = 16$
$3 \times 8 = 24$
$4 \times 8 = 32$
$5 \times 8 = 40$
$6 \times 8 = 48$
$7 \times 8 = 56$
$8 \times 8 = 64$
$9 \times 8 = 72$
$10 \times 8 = 80$

DIVISION

$8 \div 8 = 1$
$16 \div 8 = 2$
$24 \div 8 = 3$
$32 \div 8 = 4$
$40 \div 8 = 5$
$48 \div 8 = 6$
$56 \div 8 = 7$
$64 \div 8 = 8$
$72 \div 8 = 9$
$80 \div 8 = 10$

EXERCISE 104. — ORAL

1. In a working week there are 6 days. If a working day consists of 8 hours, how many hours in a week?
2. How many such working days in 32 hours?
3. An engine consumes 8 tons of coal a day. How many tons will it consume in 5 days?
4. At a cost of \$4 per ton, what is the cost of running the engine for a day?
5. How many days will it take the engine to consume 64 tons of coal?
6. There are 9 children in the class and each child is 8 years old. What is the combined ages of all of them?
7. How many chairs at 8 dollars apiece may be bought for 72 dollars?
8. How much is 2 times 8? 5 times 8? 7 times 8?
9. How many 8's in 80? 40? 48? 32? 24?

EXERCISE 105.—WRITTEN

Find the sum of:

1. 598	2. 429	3. 969	4. 899	5. 985	6. 999
999	999	192	993	999	999
929	992	999	299	999	259
992	999	199	999	699	969
999	989	932	939	429	199
<u>559</u>	<u>629</u>	<u>537</u>	<u>529</u>	<u>429</u>	<u>449</u>

EXERCISE 106.—ORAL

Count by 9's to 18; 36; 54; 63; 90.

	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>
	9	9	9	9	9	9	9	9	9
Once 9 is	9	<u>9</u>	9	9	9	9	9	9	9
Two times 9 are	.	<u>18</u>	9	9	9	9	9	9	9
Three times 9 are	.	.	<u>27</u>	9	9	9	9	9	9
Four times 9 are	.	.	.	<u>36</u>	9	9	9	9	9
Five times 9 are	<u>45</u>	9	9	9	9
Six times 9 are	<u>54</u>	9	9	9
Seven times 9 are	<u>63</u>	9	9
Eight times 9 are	<u>72</u>	9
Nine times 9 are	<u>81</u>
Ten times 9 are	<u>90</u>

Read the table at the left; as, Once 9 is 9, etc.

How many times 9 is 18? 27? 36? 45? 54? 63? 72?
81? 90? as, Two times 9 are 18.

How many 9's in 18? 27? 36? 45? 54? 63? 72?
81? 90?

How many 9's make 18? 9 is what part of 18?

How many 9's make 27? 9 is what part of 27?

EXERCISE 107.—WRITTEN

Copy and commit to memory each of these tables:

MULTIPLICATION

$1 \times 9 = 9$
$2 \times 9 = 18$
$3 \times 9 = 27$
$4 \times 9 = 36$
$5 \times 9 = 45$
$6 \times 9 = 54$
$7 \times 9 = 63$
$8 \times 9 = 72$
$9 \times 9 = 81$
$10 \times 9 = 90$

DIVISION

$9 \div 9 = 1$
$18 \div 9 = 2$
$27 \div 9 = 3$
$36 \div 9 = 4$
$45 \div 9 = 5$
$54 \div 9 = 6$
$63 \div 9 = 7$
$72 \div 9 = 8$
$81 \div 9 = 9$
$90 \div 9 = 10$

EXERCISE 108.—ORAL

1. There are 9 players on a baseball team. How many players on 2 teams?
2. There are 9 innings in a game. How many innings in two games?
3. If 9 hours are a day's work, how many working days in 36 hours?
4. How many innings will a team have if it plays one game a day for a school week?
5. How many pieces of ribbon 9 inches long are in a piece 72 inches long?
6. If shoe plates cost 9 cents a pair, what will 3 pairs cost?
7. Our school year is divided into 4 quarters of 9 weeks each. How many weeks in a school year?

EXERCISE 109.—WRITTEN

Copy and commit to memory each of these tables :

MULTIPLICATION

$1 \times 10 =$	10
$2 \times 10 =$	20
$3 \times 10 =$	30
$4 \times 10 =$	40
$5 \times 10 =$	50
$6 \times 10 =$	60
$7 \times 10 =$	70
$8 \times 10 =$	80
$9 \times 10 =$	90
$10 \times 10 =$	100

DIVISION

$10 \div 10 =$	1
$20 \div 10 =$	2
$30 \div 10 =$	3
$40 \div 10 =$	4
$50 \div 10 =$	5
$60 \div 10 =$	6
$70 \div 10 =$	7
$80 \div 10 =$	8
$90 \div 10 =$	9
$100 \div 10 =$	10

EXERCISE 110.—ORAL

1. How many cents in 4 dimes? In 7 dimes?
2. How many dollars in six 10-dollar bills?
3. How many dimes in 60 cents? In 70 cents?
4. If crackers are worth 10 cents a package, what are 8 packages worth?
5. A boy's high school books cost him 10 dollars. How much will 8 of his classmates have to pay for their books at the same rate?
6. If the drayage on one barrel of flour is 10 cents, what will be the drayage on 7 barrels?
7. At 10 cents apiece, how many tablets can be bought for 40 cents?
8. If a package of corn starch costs 10 cents, what will 5 pounds cost?

SIXTHS, EIGHTHS, AND TENTHS OF NUMBERS

EXERCISE 111. — ORAL

1. If you have six marbles and lose one of them, what part of your marbles do you lose? One marble is what part of 6 marbles?

2. How many 2-dollar bills are equal to 20 dollars? How many 2's make 20? 2 is what part of 20?

3. There are 16 in the Latin class, but 2 are absent to-day. What part of the class is absent? How many 2's make 16? 2 is what part of 16?

4. John spent 40 cents at a bookstore. He paid 5 cents of the amount for a pencil. What part of his money did he pay for the pencil?

5. How many 3's make 24? 3 is what part of 24?

6. How many 7's make 21? 7 is what part of 21?

7. How many 4's make 40? 4 is what part of 40?

8. How many 6's make 48? 6 is what part of 48?

9. How many 7's make 42? 7 is what part of 42?

10. How many 6's make 30? 6 is what part of 30?

11. 6 is what part of 12? Of 18? Of 24?

12. 5 is what part of 10? Of 15? Of 20? Of 25?
Of 45?

EXERCISE 112.—ORAL

1. How many 2's in 20? 2 is what part of 20?
2. How many 3's in 18? 3 is what part of 18?
3. How many 4's in 32? 4 is what part of 32?
4. How many 3's in 30? 3 is what part of 30?
5. What is $\frac{1}{6}$ of 12? How much is 12 and $\frac{1}{6}$ of 12?
6. What is $\frac{1}{3}$ of 24? How much is 24 and $\frac{1}{3}$ of 24?
7. What is $\frac{1}{10}$ of 50? How much is 50 and $\frac{1}{10}$ of 50?
8. 5 is what part of 30? How much is 30 and $\frac{1}{6}$ of 30?
9. 10 is what part of 80? How much is 80 and $\frac{1}{8}$ of 80?
10. How many 7's in 56? 7 is what part of 56?
11. How much is 56 and $\frac{1}{8}$ of 56?
12. How many 5's in 40? 5 is what part of 40?
13. What is $\frac{1}{8}$ of 40? How much is 40 and $\frac{1}{8}$ of 40?
14. What is $\frac{3}{8}$ of 40? How much is 40 and $\frac{3}{8}$ of 40?
15. How many 8's in 80? 8 is what part of 80?
16. How much is 80 and $\frac{1}{10}$ of 80? How much is 80 and $\frac{3}{8}$ of 80?
17. I have \$80. John has $\frac{1}{8}$ more than I have. How many more dollars has he than I have?
18. A man bought a pig for \$12 and sold it for $\frac{1}{8}$ more than the cost. How many dollars did he gain?
19. An article that cost 20 cents was sold for $\frac{1}{10}$ more than the cost. What was the gain in cents?
20. What is $\frac{1}{8}$ of 16? What is $\frac{3}{8}$ of 16? How much is 16 and $\frac{5}{8}$ of 16?

MULTIPLICATION

EXERCISE 113.—WRITTEN

123 Multiplicand
 4 Multiplier
 492 Product

Multiply 123 by 4. Begin to multiply at the right. 4 times 3 units are 12 units, or 1 ten and 2 units. Write the 2 units in the units' place and carry the 1 ten. 4 times 2 tens are 8 tens, to which add the 1 ten of the 12 units, and there are then 9 tens. Write 9 in the tens' place. 4 times 1 hundred are 4 hundred. Write 4 in the hundreds' place.

Multiply the following:

1.	2.	3.	4.	5.	6.	7.
213	324	223	431	242	224	422
<u>3</u>	<u>2</u>	<u>4</u>	<u>2</u>	<u>4</u>	<u>4</u>	<u>4</u>
8.	9.	10.	11.	12.	13.	14.
423	324	234	243	432	314	244
<u>8</u>	<u>5</u>	<u>3</u>	<u>9</u>	<u>6</u>	<u>7</u>	<u>4</u>
15.	16.	17.	18.	19.	20.	21.
342	344	288	345	678	471	219
<u>6</u>	<u>5</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>	<u>2</u>
22.	23.	24.	25.	26.	27.	28.
243	651	148	489	147	256	876
<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>5</u>	<u>6</u>	<u>6</u>
29.	30.	31.	32.	33.	34.	35.
349	123	123	987	654	987	654
<u>6</u>	<u>7</u>	<u>8</u>	<u>7</u>	<u>8</u>	<u>8</u>	<u>7</u>

MULTIPLICATION OF UNITED STATES MONEY

EXERCISE 114.—ORAL

CAMP OUTFIT

1. There are 8 campers in a party. The tent costs them \$4 each. What is the entire cost?

2. The flooring costs 50 cents each. What is the entire cost?

3. The cots cost \$1.50 each. What is the entire cost?

4. A blue flame oil stove costs 50 cents each. What is the entire cost?

5. The oven for the stove costs 25 cents each. What is the entire cost?

Find the cost of the following additional items:

6. 10 yards of mosquito netting at 5 cents per yard.

7. 6 camp stools at 30 cents each.

8. 2 cake pans at 20 cents each.

9. 2 washbasins at 12 cents each.

10. 3 kitchen spoons at 5 cents each.

11. 3 yards of white oilcloth at 25 cents a yard.

12. 4 large plates at 7 cents each.

13. 8 small plates at 6 cents each.

14. 2 large bowls at 12 cents each.

15. 6 steel knives at 7 cents each.

EXERCISE 115. — WRITTEN

How much is 5 times \$3.25?

$$5 \times \$3.25 = \$16.25, \text{ hence}$$

To multiply United States money, multiply in the usual way, and if there are cents expressed in the amount of money, place the period before the tens' place of the product.

- | | | |
|-------------|--------------|--------------|
| 1. Multiply | \$3 by 3. | \$8.40 by 2. |
| | \$3.10 by 5. | \$2.20 by 3. |
| | \$4.40 by 2. | \$4.05 by 6. |
| | \$9.10 by 6. | \$2.12 by 4. |

2. It costs \$8 an acre to grow sweet potatoes. What would 4 such acres cost?

3. The potatoes from an acre sold for \$32. What would 4 such acres of potatoes bring?

4. Find the cost of 8 clocks at \$27.50 apiece.

5. What will 5 hats cost at \$4.50 apiece?

6. What will be the cost of 4 pairs of shoes at \$4.25 a pair?

7. A man paid \$87.50 apiece for 5 typewriters. What was the total cost?

8. I bought a field containing 6 acres of land and paid \$125 an acre for it. What did the field cost me?

9. What will be the cost of 9 tons of coal at \$4.75 a ton?

10. What is the cost of 8 cords of wood at \$3.50 a cord?

11. A laborer received \$2.50 for a day's work. How much did he receive for 6 days' work at the same rate?

MULTIPLICATION

25 times 31 = ?

(a)

$$\begin{array}{r}
 31 \\
 25 \\
 \hline
 155 \quad 5 \times 31 \\
 20 \quad 20 \times 1 \\
 \hline
 600 \quad 20 \times 30, \text{ or } 3 \text{ tens} \\
 775 \quad 25 \times 31
 \end{array}$$

EXPLANATION

(a) First multiply 31 by 5, and then by 20, or 2 tens:
 5 times 31 are 155.
 20 times 1 are 20.
 20 times 3 tens, or 30, are 60 tens, or 600. The sum of these products is 775.

(b)

$$\begin{array}{r}
 31 \\
 25 \\
 \hline
 155 \\
 62 \\
 \hline
 775
 \end{array}$$

(b) The work may be shortened by omitting the 0's, as in (b).

EXERCISE 116. — WRITTEN

1. Multiply \$43 by 21; by 45; by 67; by 28.
2. Multiply 456 by 34; by 45; by 56.
3. Multiply 186 by 14; by 25; by 62.
4. A farmer sold 35 bales of cotton. If the average weight of a bale was 523 pounds, how many pounds of cotton did he sell?
5. If a ton of fertilizer costs \$23, how much will 17 tons cost?
6. Counting 365 days in a year, how many days old is a boy who is just 15 years old?
7. A bushel of corn weighs 56 pounds. What is the weight of 37 bushels?

DIVISION

Division may be expressed in several ways; for instance, these two expressions mean that we are to divide 35 by 5, —

$$35 \div 5$$

$$5 \overline{)35}$$

In each case the number to be divided is called the **dividend**, the number that we divide by is called the **divisor**, and the number telling how many times the dividend contains the divisor is called the **quotient**; as,

$$35 \div 5 = 7$$

$$\begin{array}{r} 5 \overline{)35} \\ 7 \end{array}$$

In the above examples 35 is the dividend, 5 is the divisor, and 7 is the quotient.

EXERCISE 117. — ORAL

1. If one pound of flour is equal to four cups of flour, how many pounds in 12 cups of flour?
2. How many days make a week? How many weeks in 14 days? In 21 days? In 28 days? In 40 days?
3. If a steamboat goes at the rate of 9 miles an hour, how many miles will it go in 3 hours? In 6 hours? In 4 hours?
4. How long will it take the steamboat to go from one town to another town 36 miles away?

5. Read the following and give the quotients:

$24 \div 6$; $18 \div 3$; $21 \div 7$; $16 \div 4$; $28 \div 4$; $45 \div 9$.

$6 \overline{)18}$; $3 \overline{)21}$; $7 \overline{)28}$; $4 \overline{)36}$; $2 \overline{)18}$; $9 \overline{)72}$; $7 \overline{)56}$; $9 \overline{)27}$.

EXERCISE 118. — WRITTEN

Divide 484 by 4.

OPERATION

$4 \overline{)484}$
 $\underline{121}$

Since 4 is contained in 400, 100 times, we write 1 in the hundreds' place. Since 4 is contained in 8 tens, or 80, 20 times, we write 2 in the tens' place. Since 4 is contained in 4, 1 time, we write 1 in the units' place. Therefore, 4 is contained 121 times in 484.

In ordinary practice, no attention is paid to the fact that the number being divided is in the hundreds', tens', or units' place.

Divide 369 by 3.

OPERATION

ORDINARY PRACTICE

$3 \overline{)369}$
 $\underline{123}$

Beginning at the left, we say, 3 into 3, 1 time (writing 1 in the hundreds' place); 3 into 6, 2 times (writing 2 in the tens' place); 3 into 9, 3 times (writing 3 in the units' place).

If, before the division is completed, there is a remainder, the figure that stands for the remainder may be regarded as being written in front of the next figure of the dividend and both are considered together; as,

Divide 572 by 4.

OPERATION

ORDINARY PRACTICE

$4 \overline{)572}$
 $\underline{143}$

Begin at the left and say, 4 into 5, 1 time and 1 over. 4 into 17, 4 times and 1 over. 4 into 12, 3 times.

Divide the following :

1. $2 \overline{)468}$	2. $2 \overline{)868}$	3. $3 \overline{)963}$	4. $4 \overline{)484}$	5. $2 \overline{)642}$	6. $3 \overline{)121}$
7. $3 \overline{)156}$	8. $5 \overline{)615}$	9. $3 \overline{)159}$	10. $3 \overline{)219}$	11. $5 \overline{)675}$	12. $4 \overline{)168}$
13. $4 \overline{)204}$	14. $4 \overline{)928}$	15. $2 \overline{)546}$	16. $4 \overline{)724}$	17. $4 \overline{)576}$	18. $3 \overline{)465}$
19. $2 \overline{)310}$	20. $3 \overline{)678}$	21. $5 \overline{)765}$	22. $4 \overline{)572}$	23. $4 \overline{)984}$	24. $3 \overline{)795}$
25. $5 \overline{)785}$	26. $6 \overline{)792}$	27. $7 \overline{)154}$	28. $9 \overline{)126}$	29. $4 \overline{)732}$	30. $5 \overline{)725}$
31. $6 \overline{)852}$	32. $7 \overline{)924}$	33. $8 \overline{)920}$	34. $9 \overline{)378}$	35. $8 \overline{)336}$	36. $7 \overline{)294}$
37. $9 \overline{)198}$	38. $7 \overline{)231}$	39. $5 \overline{)955}$	40. $8 \overline{)904}$	41. $7 \overline{)154}$	42. $6 \overline{)906}$
43. $8 \overline{)264}$	44. $9 \overline{)477}$	45. $8 \overline{)424}$	46. $7 \overline{)448}$	47. $9 \overline{)567}$	48. $6 \overline{)336}$
49. $3 \overline{)702}$	50. $4 \overline{)532}$	51. $6 \overline{)924}$	52. $9 \overline{)738}$	53. $7 \overline{)994}$	54. $6 \overline{)444}$
55. $9 \overline{)657}$	56. $8 \overline{)752}$	57. $7 \overline{)595}$	58. $5 \overline{)985}$	59. $6 \overline{)984}$	60. $5 \overline{)785}$

DIVISION OF UNITED STATES MONEY

EXERCISE 119.—ORAL

1. Four boys, James, Frank, Martin, and Stuart, wished to earn money during vacation. In one week they earned \$4.40 by picking strawberries. How much did each boy earn a week?

2. The next week they weeded onion beds and earned \$2.40. How much did they earn apiece? How much did each earn a day?

3. They picked blackberries which they sold for 40 cents. How much was that apiece?

4. If the blackberries sold for 5 cents a quart, how many quarts were there?

EXERCISE 120.—WRITTEN

1. Mary, Alice, Bessie, Lucy, and Kate went with their mothers to the seashore for a ten days' outing. Each had the same amount of spending money, and all together they had \$6.25. How much was that apiece?

2. During their stay they all together had 30 rides on the Merry Go Round. If tickets cost "6 for a quarter," how many quarters did each pay for her rides?

3. The bathing house cost \$2.70 for 9 days. How much was that for each day? How much did each girl have to pay for the bathhouse each day?

4. Roller skates for 3 days cost \$1.50. How much was that for each day? How much did each girl have to pay for each day?

5. They had their photographs taken in a group. Five cost 75 cents. What did the photographs cost apiece?

6. Each sent 2 post cards to her father. The cards cost "2 for 5 cents," and a 1-cent stamp was used on each card. What was the total cost of the post cards?

7. At \$4 a cord, how many cords of wood can be bought for \$624?

8. How many pairs of shoes at \$5 a pair can be bought for \$85?

9. A carpenter was paid \$96 for his work at \$3 a day. How many days did he work?

10. A clerk finds that he can save \$6 a week from his salary. How many weeks will it take him to save \$732?

11. How many acres of land at \$9 an acre can be bought for \$828?

12. How many 5-dollar bills make \$485?

13. A hardware merchant paid \$128 for eight stoves. What was the price paid for each stove?

14. A passenger train runs a distance of 84 miles in 3 hours. How far does it run in an hour?

15. If I am able to pay \$9 a month on a debt of \$162, how long will it take me to pay the debt?

16. The freight on one car load of lumber is \$8. If my freight bill on lumber is \$112, how many car loads did I receive?

READING AND WRITING NUMBERS

EXERCISE 121.—ORAL

1. Tell the hundreds, tens, and units in 145, 264, 896, 273, 456, 975.
2. 10 hundred is written 1000, and is called one thousand.
3. Tell the thousands, hundreds, tens, and units in 1245, 2456, 4578, 9865, 7829, 3754, 2345.
4. 1245 is read "one thousand, two hundred forty-five."

Read the following numbers:

8756	9865	2938	4579
3297	2756	4592	3689
7532	9284	9563	2937

EXERCISE 122.—WRITTEN

Express in figures:

1. One thousand, two hundred thirty-seven.
2. Six thousand, four hundred sixty-five.
3. Nine thousand, five hundred sixty-seven.
4. Three thousand, eight hundred forty-nine.
5. Four thousand, four hundred thirty.
6. Five thousand, twenty-six.
7. Seven thousand, one hundred seventeen.

PLANTS IN ROWS

EXERCISE 123.—WRITTEN

The width of rows for plants varies with the different kinds of plants. In the following tables, the width of each row and the space to be laid off in rows are given. The number of rows that can be laid off in the space given is to be found. Copy the tables and write in figures in the blank places the number of rows for each plant in the given width of space.

VEGETABLES

NAME OF PLANT	WIDTH OF ROW	WIDTH OF SPACE	NUMBER OF ROWS
Asparagus	2 feet	10 feet	—
Bush Bean	2 feet	12 feet	—
Celery	4 feet	24 feet	—
Onion	3 feet	24 feet	—
Tomato	2 feet	30 feet	—

FLOWERS

	WIDTH OF ROW	WIDTH OF SPACE	NUMBER OF ROWS
China Aster	12 inches	60 inches	—
Carnation	15 inches	30 inches	—
Marigold	18 inches	36 inches	—
Forget-me-not . .	6 inches	48 inches	—
Sweet Pea	36 inches	12 feet	—

REVIEW

EXERCISE 124. — WRITTEN

Find the sum of the following :

1. 467 bu. wheat 2. 943 lb. cotton 3. 1735 ft. lumber

398

462

4976

276

478

6421

904

397

3572

325

659

1192

718

743

401

4. 792 bbl. corn 5. 145 lb. flour

324

113

675

27

359

123

467

110

223

42

EXERCISE 125. — WRITTEN

Subtract the following :

1.

2.

3.

4.

5.

6.

7.

972

870

721

604

825

934

493

329

285

359

247

378

268

106

8.

9.

10.

11.

12.

13.

14.

876

752

424

743

901

425

904

299

365

289

699

870

375

296

15.	16.	17.	18.	19.	20.	21.
700	749	923	432	562	901	783 1
<u>693</u>	<u>285</u>	<u>462</u>	<u>119</u>	<u>376</u>	<u>458</u>	<u>6946</u> —
22.	23.	24.	25.	26.	27.	28. —
6421	5672	9123	340	1642	1570	987 5
<u>2930</u>	<u>3073</u>	<u>6129</u>	<u>275</u>	<u>325</u>	<u>325</u>	<u>25</u> —

EXERCISE 126. — WRITTEN

Multiply the following :

1.	2.	3.	4.	5.	6.	7.
2461	2543	5678	3421	4563	1234	8192
<u>3</u>	<u>4</u>	<u>2</u>	<u>4</u>	<u>3</u>	<u>4</u>	<u>2</u>
8.	9.	10.	11.	12.	13.	14.
7532	234	567	689	821	275	275
<u>4</u>	<u>26</u>	<u>42</u>	<u>23</u>	<u>45</u>	<u>56</u>	<u>34</u>

EXERCISE 127. — WRITTEN

Find the sum of :

1.	2.	3.	4.	5.	6.
567	678	456	387	486	448
567	678	456	387	486	684
567	678	456	378	486	887
567	678	456	378	486	447
567	678	456	378	486	287
567	678	456	378	486	687
<u>127</u>	<u>328</u>	<u>978</u>	<u>595</u>	<u>737</u>	<u>246</u>

REVIEW

105

7.	8.	9.	10.	11.	12.
207	218	116	137	298	387
274	281	168	646	654	239
747	218	636	234	356	827
171	181	761	271	188	357
787	878	616	125	246	336
378	989	969	983	782	472
<u>327</u>	<u>848</u>	<u>636</u>	<u>444</u>	<u>345</u>	<u>546</u>

EXERCISE 128. — ORAL

Divide the following:

1.	2.	3.	4.	5.	6.	7.	8.
7) <u>14</u>	8) <u>24</u>	7) <u>28</u>	8) <u>40</u>	7) <u>42</u>	8) <u>56</u>	8) <u>72</u>	7) <u>56</u>
9.	10.	11.	12.	13.	14.	15.	16.
8) <u>16</u>	7) <u>21</u>	8) <u>32</u>	7) <u>35</u>	8) <u>48</u>	7) <u>49</u>	8) <u>64</u>	9) <u>63</u>

EXERCISE 129. — WRITTEN

Divide the following:

1.	2.	3.	4.	5.	6.
7) <u>1491</u>	8) <u>2496</u>	7) <u>2975</u>	8) <u>1720</u>	7) <u>4697</u>	7) <u>126</u>

Multiply the following:

1.	2.	3.	4.	5.	6.	7.	8.
278	6187	847	4718	728	1827	2678	7381
<u>4</u>	<u>9</u>	<u>7</u>	<u>8</u>	<u>5</u>	<u>6</u>	<u>3</u>	<u>2</u>

EXERCISE 130. — WRITTEN

Divide the following:

1.	2.	3.	4.	5.
9) <u>1917</u>	9) <u>3069</u>	9) <u>4059</u>	9) <u>54603</u>	9) <u>72801</u>

Multiply the following:

6.	7.	8.	9.
4987	6532	3267	8976
<u>9</u>	<u>9</u>	<u>9</u>	<u>9</u>

10.	11.	12.	13.
4987	2356	2378	5649
<u>8</u>	<u>8</u>	<u>8</u>	<u>8</u>

Find the sum of:

14.	15.	16.	17.	18.
789	168	479	243	983
789	866	474	516	519
789	248	443	341	987
789	968	426	762	321
789	445	457	215	418
789	563	142	482	571
<u>229</u>	<u>628</u>	<u>435</u>	<u>123</u>	<u>321</u>

19.	20.	21.	22.	23.
241	123	222	333	421
523	245	432	222	123
545	324	521	111	456
876	564	643	333	783
859	258	254	213	241
253	321	564	123	412
251	452	254	321	222
<u>345</u>	<u>213</u>	<u>643</u>	<u>415</u>	<u>531</u>

TELLING THE TIME

EXERCISE 131. — ORAL

1. How many times does the minute hand move around the clock face in an hour ?

2. How many times does the minute hand move around the clock face from 12 o'clock to 2 o'clock ?

3. With the minute hand and hour hand at 12 o'clock, how far will the hour hand move while the minute hand moves around to 12 again ?

4. The distance the minute hand moved is how many times the distance the hour hand moved ?

5. The distance that the hour hand moved is what part of the distance that the minute hand moved ?

6. How many minutes are required for the minute hand to move from I to II ?

7. The distance around the clock has how many "5-minute spaces" ?

8. When the hour hand is at IV and the minute hand at XII, what time is it ?

When the minute hand moves down to III, what time is it ?

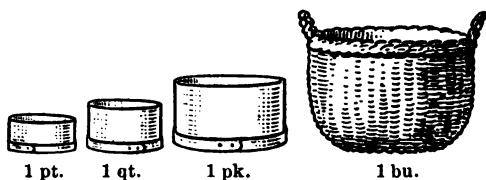
9. When John's school opens in the morning the minute hand is at IX, and the hour hand is between VIII and IX. What time does his school open in the morning ?

If it takes 8 minutes for him to walk from home to school, at what time of day should he leave home to be "just in time" ?

DRY MEASURE

TABLE

2 pints (pt.) make 1 quart (qt.)
8 quarts make 1 peck (pk.)
4 pecks make 1 bushel (bu.)



EXERCISE 132.—ORAL

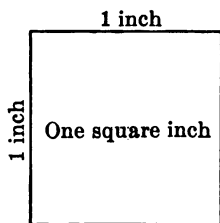
1. A quart is equal to how many pints? Two quarts are equal to how many pints?
2. A peck contains how many quarts? How many pints?
3. Two pecks are equal to how many quarts?
4. How many quarts in half of a bushel? How many pints in 8 quarts?
5. One bushel contains how many quarts?
6. Two pecks and one quart are equal to how many quarts?
7. Three pecks and three quarts are equal to how many quarts?
8. One peck, one quart, and one pint are together equal to how many pints?

EXERCISE 133.— WRITTEN

1. Mary's mother bought a bushel of peaches to preserve. How many quarts did she buy?
2. She knew that she must allow $\frac{1}{2}$ for shrinkage in preserving. How many quart cans would she need?
3. She decided, however, to put $\frac{1}{2}$ of the preserves into pint cans. How many pint cans should she have?
4. After she had put half of the preserves into quart cans and the other half of the preserves into pint cans, how many cans of preserves did she have in all?
5. Garden peas are sold in quart boxes. How many boxes will be required for 5 bushels of garden peas? At 10 cents a box, what would be received for the 5 bushels?
6. Jerry Moore of South Carolina raised 228 bushels and 3 pecks of corn on his prize acre, and Stephen Henry of Louisiana raised 139 bushels on his prize acre. How much more corn did Jerry Moore raise than Stephen Henry?
7. Joe Stone of Georgia raised 102 bushels of corn on an acre; Ernest Starnes raised 146 bushels of corn on an acre. How much more corn did Ernest Starnes raise than Joe Stone?
8. How much more corn did Jerry Moore raise than Ernest Starnes?
9. How many more pecks of corn did Jerry Moore raise than Ernest Starnes?
10. It cost Jerry Moore 42 cents a bushel to grow his corn and it cost Ernest Starnes 27 cents a bushel. How much more a bushel did Jerry Moore's corn cost than Ernest Starnes's?

SQUARE MEASURE

Square measure is used in measuring surfaces.



A square inch is a square having sides an inch long.

A square foot is a square having sides a foot long.

A square yard is a square having sides a yard long.

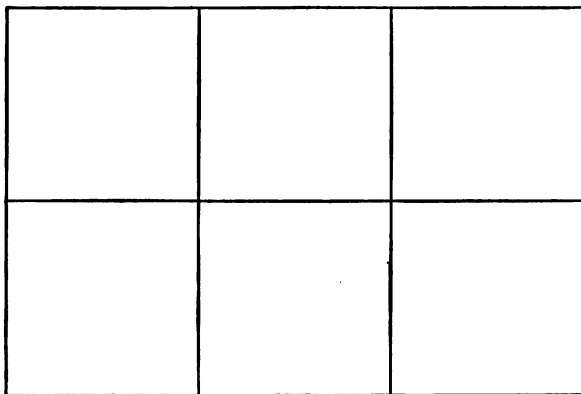
HOW TO FIND THE AREA OF A SURFACE

TABLE

144 square inches (sq. in.) make 1 square foot (sq. ft.)

9 square feet make 1 square yard (sq. yd.)

EXERCISE 134.—ORAL



1. Look at the above rectangle. How many square inches in the top row? How many square inches in both rows?

2. How many square inches in the rectangle? How many are 2 times 3 square inches?

Notice that the product of the length (3) and the width (2), or 6, is the number of square inches in the rectangle, — hence.

The **Area** of any surface is expressed by the product of the two sides when the unit of measure of the two sides is the same, — that is, if the length of one side is given in inches, the other side must be given in inches also, etc.

EXERCISE 135. — WRITTEN

1. How many square inches in a rectangle 4 inches long and 3 inches wide?

2. How many square inches in a square whose sides are 5 inches long?

3. How many square inches in a rectangle 9 inches long and 6 inches wide?

4. What is the area of a square whose sides are 10 inches long?

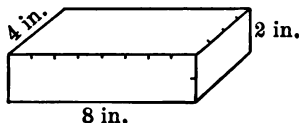
5. Draw the figure required to prove each of the above examples.

6. Draw a square whose sides are 12 inches, or one foot, long. How many square inches in this square? How many square inches in a square foot?

7. The drawing represents a wooden block that is 8 in. long, 4 in. wide, and 2 in. thick.

How many faces of the block are shown? How many square inches in the top face? In the side face? In the end face?

How many square inches in the three faces?



8. How many faces of the block are not seen? How many square inches of the surface of the block are not in sight? How many square inches are there in the entire surface of the block?

9. How many square feet in a rectangle 3 feet long and 2 feet wide?

10. How many square feet in a rectangle 4 feet long and 3 feet wide? In a rectangle 6 ft. long and 4 ft. wide? In a rectangle 9 ft. long and 6 ft. wide?

11. How many square feet in a square whose sides are 3 ft. long? Whose sides are one yard long? How many square feet in a square yard?

12. How many square yards in a wall 6 yards long and 3 yards high?

13. How many square feet in the ceiling of a room 18 ft. wide and 24 ft. long?

14. If 9 sq. ft. make one square yard, how many square yards in the ceiling?

15. How many square yards in the ceiling of a room 6 yd. wide and 8 yd. long? Is this room larger or smaller than the room in example 13?

16. How many square yards in a floor 15 feet wide and 18 feet long? Which do you think is the easier way to solve this problem, — divide the product of 15 and 18 by the number of square feet in a yard, or change 15 ft. and 18 ft. both to yards and find the product?

17. How many square inches in the top of a table 24 inches wide and 36 inches long? How many square feet in this table?

LONG DIVISION

EXERCISE 136. — WRITTEN

1. How many times is 14 contained in 2968 ?

OPERATION	EXPLANATION
14)2968(212	We see that 2, the first figure of the dividend, does not contain 14.
28	
<u>16</u>	We see that 29, the first two figures of the dividend, contains 14, though we do not know how many times.
14	
<u>28</u>	We see that the "1" of 14 is contained 2 times in the "2" of 29; and we think therefore that 14 may be contained 2 times in 29. Write 2 in the quotient, multiply 14 by 2, and write the product, 28, under 29.
28	
<u>28</u>	
	Subtract 28 from 29, and bring down 6, the next figure of the dividend. We see that 16 contains 14 one time.
	Write 1 in the quotient, multiply 14 by 1, and write the product, 14, under 16.
	Subtract 14 from 16 and bring down 8, the next figure of the dividend.
	28 contains 14 two times.
	Write 2 in the quotient, multiply 14 by 2, and write the product, 28, under 28.
	Subtract 28 from 28, and there is no remainder.
	Therefore, 14 is contained 212 times in 2968.

This method of finding how many times one number contains another is called **Long Division**.

2. How many times is 18 contained in 414?

OPERATION

EXPLANATION

18)414(23

36

54

54

We see that 41, the first two figures of the dividend, contains 18, the divisor, though we do not know how many times.

The "1" of 18 is contained 4 times in the "4" of 41, and we think therefore that 18 may be contained 4 times in 41. But, multiplying 18 by 4 gives a product, 72, which is larger than 41, hence 18 is not contained 4 times in 41.

In the same way we find that 18 is not contained 3 times in 41.

A little practice will soon enable one to find readily the correct figure for the quotient.

Find the quotient in the following :

3. 21)483(	24)624(	21)882(	23)621(
4. 23)276(	23)483(	23)529(	21)688(
5. 25)650(	21)672(	24)648(	24)624(
6. 25)649(	26)702(	27)837(	28)644(
7. 26)1092(	27)945(	28)728(	26)832(
8. 32)1536(	38)1748(	46)1794(	78)936(

Divide :

9. 3094 by 14	3248 by 14	3165 by 15
10. 4976 by 16	1932 by 16	3345 by 15
11. 3604 by 17	2178 by 18	5796 by 17
12. 2299 by 19	5025 by 15	2248 by 16
13. 4066 by 19	1279 by 19	4284 by 18
14. 3906 by 18	5304 by 17	6768 by 16
15. 3225 by 15	2320 by 16	6356 by 17

BIRDS AND INSECTS

EXERCISE 137. — WRITTEN

1. In 25 days the chickadee has been known to destroy 750 cankerworms. How many was that for each day?

2. The stomachs of 45 cuckoos were examined, and in them were found 1170 insects. If each cuckoo caught the same number of insects, how many did each catch?

3. If a cuckoo's working day is 13 hours long, how many insects an hour did a cuckoo catch?

4. In the stomach of one cuckoo alone there were 250 caterpillars. If the bird caught all of them in one day, how many did he average for each hour?

5. The stomachs of 7 robins were examined, and 1865 insects were found in them. If each robin caught the same number, how many did they catch apiece? How many was that for each of his 13 working hours?

6. During the summer the cankerworm lays eggs daily in masses of about 185 each. If exactly 185 eggs were laid daily, in how many days would a cankerworm lay 4255 eggs?

7. The tent caterpillar lays her eggs on twigs during the month of June in groups of 225 eggs each. How many young caterpillars shall we have from the eggs of 6 caterpillars during a season, if all their eggs hatch?

LIQUID MEASURE

EXERCISE 138.—ORAL

Liquid Measure is used in measuring such liquids as water, milk, vinegar, and molasses.

TABLE

2 pints (pt.) make 1 quart (qt.)

4 quarts make 1 gallon (gal.)

1. How many pints in a quart? 1 pint is what part of a quart?

2. How many quarts in a gallon? 1 quart is what part of a gallon?

3. I bought 2 quarts and 1 pint of milk and sent 3 pints of it to a sick person. How many pints did I buy? How many pints did I have left after sending to the sick person?

EXERCISE 139.—WRITTEN

1. My oil can holds just 4 gallons and 3 quarts. How many quarts are in it when it is just full? If oil costs 12 cents a gallon, what will a quart cost? What shall I have to pay for my can full of this oil?

2. If cream costs 22 cents a pint, what shall I have to pay for 3 quarts and 1 pint of cream?

3. I buy 1 pint of milk every day at 4 cents a pint. What will be the cost of my milk for two weeks? How *many quarts* shall I buy in two weeks?

ADDITION OF FRACTIONS

EXERCISE 140.—ORAL

1. John cut an apple into three equal parts, and gave one piece to his sister, one to his brother, and kept the third piece. What part of the apple did he give away?

2. A man laid off his garden into 7 equal parts. He planted beans in one of the equal parts; peas in two parts; tomatoes in three parts. How much of the garden was planted in beans? How much in peas? How much in tomatoes? How much remained unplanted?

3. Find the sum of: $\frac{1}{7}$, $\frac{2}{7}$, and $\frac{3}{7}$; $\frac{1}{8}$, $\frac{2}{8}$, and $\frac{4}{8}$.

4. A man sold $\frac{1}{4}$ of a cord of wood to Mr. Jones; $\frac{3}{4}$ of a cord to Mr. Smith; and $\frac{1}{4}$ of a cord to Mr. Brown. How many fourths of a cord did he sell?

In each of the above examples we found the sum of the fractions by adding their numerators. We say then that we find the sum of two or more fractions, whose names or denominators are alike, by adding their numerators.

EXERCISE 141.—WRITTEN

How do you find the sum of two fractions when their names, or denominators, are alike?

Find the sum of:

1. $\frac{2}{6} + \frac{2}{6}$

$\frac{1}{5} + \frac{2}{5} + \frac{1}{5}$

$\frac{2}{9} + \frac{3}{9} + \frac{2}{9}$

2. $\frac{1}{3} + \frac{1}{3}$

$\frac{1}{6} + \frac{3}{6} + \frac{1}{6}$

$\frac{2}{11} + \frac{5}{11} + \frac{2}{11}$

3. $\frac{1}{4} + \frac{2}{4}$

$\frac{2}{7} + \frac{3}{7} + \frac{1}{7}$

$\frac{1}{12} + \frac{5}{12} + \frac{3}{12}$

SUBTRACTION OF FRACTIONS

EXERCISE 142.—ORAL

1. A father divided an apple into 3 equal parts. He gave 1 part to his son and 1 part to his daughter. How many parts did he give away? How much of the apple did he have left? How much is $\frac{2}{3}$ less $\frac{2}{3}$?

2. A boy had three fourths of a bushel of string beans. He sold one fourth of a bushel at a boarding house. How many fourths of a bushel did he have left? How much is $\frac{3}{4}$ less $\frac{1}{4}$?

3. Mr. Jones owned four fifths of a cotton factory. He sold one fifth of the factory to Mr. Thomas. How much of the factory did he then own? How much is $\frac{4}{5}$ less $\frac{1}{5}$?

4. A man bought five sevenths of the stock of a hosiery mill and gave three sevenths to his son. How much of the stock did he still own? How much is $\frac{5}{7}$ less $\frac{3}{7}$?

5. The above examples teach us how to subtract one fraction from another fraction when both have the same name or denominator. Can you tell me how it is done?

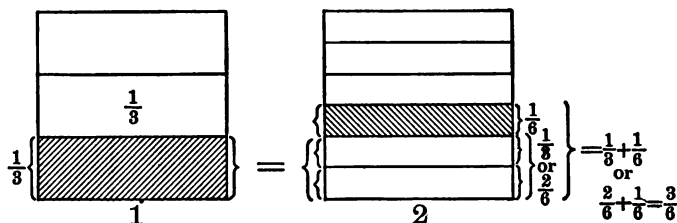
EXERCISE 143.—WRITTEN

Copy and write the remainders:

1. $\frac{3}{4} - \frac{1}{4} = ?$ $\frac{9}{10} - \frac{7}{10} = ?$ $\frac{4}{5} - \frac{2}{5} = ?$ $\frac{7}{8} - \frac{3}{8} = ?$
2. $\frac{9}{12} - \frac{5}{12} = ?$ $\frac{7}{11} - \frac{5}{11} = ?$ $\frac{12}{15} - \frac{7}{15} = ?$ $\frac{7}{9} - \frac{4}{9} = ?$
3. $\frac{6}{7} - \frac{4}{7} = ?$ $\frac{5}{8} - \frac{4}{8} = ?$ $\frac{5}{6} - \frac{3}{6} = ?$ $\frac{7}{15} - \frac{3}{15} = ?$

FRACTIONS

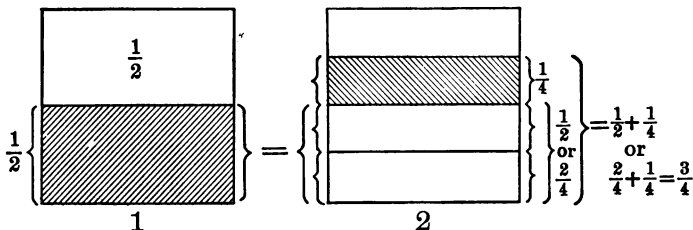
EXERCISE 144.—ORAL



Look at these two equal squares.

1. What part of the first square is shaded?
2. What part of the second square is shaded?
3. The two shaded pieces are together equal to how much of the second square?
4. One third and one sixth equal how much?
5. Copy $\frac{1}{3} + \frac{1}{6} = \frac{2}{6} + \frac{1}{6} = \frac{3}{6}$.

EXERCISE 145.—ORAL



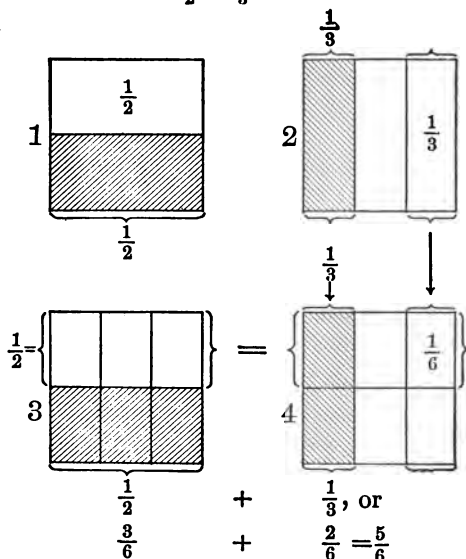
Look at these two equal squares.

1. What part of the first square is shaded?

2. What part of the second square is shaded?
3. The two shaded pieces are together equal to how much of the second square?
4. One half and one fourth equal how much?
5. Copy $\frac{1}{2} + \frac{1}{4} = \frac{2}{4} + \frac{1}{4} = \frac{3}{4}$.

EXERCISE 146.—ORAL

$$\frac{1}{2} + \frac{1}{3} = ?$$



Look at these four squares.

1. What part of the first square is shaded?
2. What part of the third square is shaded?
3. One half equals how many sixths? (See third square.)
4. What part of the second square is shaded?
5. What part of the fourth square is shaded?

6. The shaded parts of the two lower squares equal how many pieces?

7. The shaded parts of the two lower squares equal how many sixths?

8. Copy $\frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6} = \frac{5}{6}$.

Note that to add $\frac{1}{2}$ and $\frac{1}{3}$ we changed both to fourths,
to add $\frac{1}{3}$ and $\frac{1}{6}$ we changed both to sixths, and
to add $\frac{1}{2}$ and $\frac{1}{3}$ we changed both to sixths, hence—

To add fractions when their names are not alike, change them to the same name, or denominator, and add their numerators.

TO CHANGE THE NAME OF A FRACTION WITHOUT CHANGING ITS VALUE

We know that $\frac{1}{2} = \frac{3}{6}$; and if we multiply both terms of $\frac{1}{2}$ by 3, we have $\frac{1}{2} = \frac{3}{6}$, as $\frac{3 \times 1}{3 \times 2} = \frac{3}{6}$

We know that $\frac{3}{6} = \frac{1}{2}$; and if we divide both terms of $\frac{3}{6}$ by 3, we have $\frac{1}{2}$, as $\frac{3 \div 3}{6 \div 3} = \frac{1}{2}$, hence—

Multiplying both terms of a fraction by the same number changes its name, but does not change its value.

Dividing both terms of a fraction by the same number changes its name, but does not change its value.

EXERCISE 147.—ORAL

1. $\frac{1}{2}$ equals how many 6ths? 4ths? 10ths? 14ths?
2. $\frac{1}{3}$ equals how many 8ths? 12ths? 16ths? 20ths?
3. Change $\frac{1}{3}$ to 9ths; to 18ths; 15ths; 21sts; 27ths.
4. What new fractions shall you get if you divide both terms of $\frac{3}{15}$ by 3? $\frac{9}{12}$ by 3? $\frac{4}{12}$ by 4? $\frac{9}{15}$ by 3?

ADDITION OF FRACTIONS

EXERCISE 148.—WRITTEN

To add fractions when their names are not alike, change them to the same name, or denominator, and add their numerators.

1. Find the sum of $\frac{1}{2} + \frac{1}{3}$.

MODEL

$$\begin{array}{ll} \frac{1}{2} + \frac{1}{3} = - + - = - & \text{First Step.} \\ \frac{1}{2} + \frac{1}{3} = \frac{1}{6} + \frac{1}{6} = \frac{2}{6} & \text{Second Step.} \\ \frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6} = \frac{5}{6} & \text{Third Step.} \end{array}$$

NOTE TO THE TEACHER. The above method has been tried in school with gratifying results, since it impressed upon the pupil that two new fractions (first step) of the same name (second step) must be found before they can be added (third step).

2. A farmer planted cotton in $\frac{1}{3}$ of his land and corn in $\frac{1}{4}$ of it. What part of his land did he plant in the two crops?

3. A town wishing to build a Y. M. C. A. building tried to raise the money by subscription. On the first day $\frac{1}{3}$ of the necessary amount was raised, and on the second day $\frac{1}{4}$ of it was raised. What part of the necessary amount was raised in these two days?

Find the sum of :

4. $\frac{1}{3} + \frac{1}{4}$ $\frac{1}{2} + \frac{1}{6}$ $\frac{1}{3} + \frac{2}{6}$

5. $\frac{1}{4} + \frac{1}{6}$	$\frac{2}{3} + \frac{1}{6}$	$\frac{1}{6} + \frac{1}{6}$	$\frac{1}{6} + \frac{1}{7}$
6. $\frac{2}{3} + \frac{1}{7}$	$\frac{1}{6} + \frac{1}{2}$	$\frac{2}{9} + \frac{1}{3}$	$\frac{1}{2} + \frac{4}{9}$

NOTE TO TEACHER. Train the pupil to find a common denominator by inspection. For instance, $\frac{2}{3} + \frac{1}{2} + \frac{5}{9} = ?$ By inspection we see that the first two denominators, 3 and 2, can be changed by multiplication to either 6 or 12, but the third denominator, 9, cannot be changed to 12 by multiplication. 9 can be changed by multiplication to 18, and so can 3 and 2. A little practice will enable pupils to find a common denominator very rapidly.

7. $\frac{1}{2} + \frac{2}{3} + \frac{1}{9}$	$\frac{2}{7} + \frac{3}{6} + \frac{1}{10}$	$\frac{1}{2} + \frac{1}{4} + \frac{1}{8}$
8. $\frac{1}{3} + \frac{1}{6} + \frac{2}{5}$	$\frac{2}{7} + \frac{1}{6} + \frac{4}{21}$	$\frac{1}{3} + \frac{1}{4} + \frac{1}{9}$
9. $\frac{1}{3} + \frac{1}{5} + \frac{1}{6}$	$\frac{1}{2} + \frac{1}{3} + \frac{1}{4}$	$\frac{3}{10} + \frac{7}{20} + \frac{3}{40}$
10. $\frac{1}{3} + \frac{2}{11} + \frac{5}{66}$	$\frac{1}{4} + \frac{2}{7} + \frac{3}{28}$	$\frac{1}{3} + \frac{1}{4} + \frac{1}{6}$
11. $\frac{1}{2} + \frac{1}{9} + \frac{1}{12}$	$\frac{1}{2} + \frac{1}{5} + \frac{1}{10}$	$\frac{1}{4} + \frac{1}{3} + \frac{1}{6}$

EXERCISE 149.—WRITTEN

To subtract one fraction from another when their names are not alike, change both to the same name, or denominator, and subtract the numerators. (See Model, addition of fractions, page 122.)

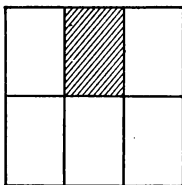
1. $\frac{2}{4} - \frac{1}{4} = ?$	2. $\frac{1}{2} - \frac{1}{8} = ?$	3. $\frac{2}{3} - \frac{1}{4} = ?$	4. $\frac{3}{4} - \frac{1}{2} = ?$
5. $\frac{3}{6} - \frac{1}{6} = ?$	6. $\frac{1}{2} - \frac{1}{10} = ?$	7. $\frac{3}{4} - \frac{1}{4} = ?$	8. $\frac{3}{4} - \frac{1}{2} = ?$
9. $\frac{1}{2} - \frac{1}{4} = ?$	10. $\frac{1}{2} - \frac{1}{12} = ?$	11. $\frac{3}{4} - \frac{1}{8} = ?$	12. $\frac{3}{4} - \frac{1}{12} = ?$
13. $\frac{1}{2} - \frac{1}{8} = ?$	14. $\frac{2}{3} - \frac{1}{3} = ?$	15. $\frac{3}{4} - \frac{1}{12} = ?$	16. $\frac{3}{4} - \frac{6}{12} = ?$
17. $\frac{1}{2} - \frac{1}{3} = ?$	18. $\frac{2}{3} - \frac{1}{6} = ?$	19. $\frac{2}{3} - \frac{1}{2} = ?$	20. $\frac{3}{4} - \frac{1}{2} = ?$
21. $\frac{4}{6} - \frac{1}{3} = ?$	22. $\frac{5}{6} - \frac{2}{3} = ?$	23. $\frac{5}{6} - \frac{2}{12} = ?$	24. $\frac{3}{4} - \frac{3}{12} = ?$
25. $\frac{3}{4} - \frac{8}{12} = ?$	26. $\frac{5}{8} - \frac{5}{16} = ?$	27. $\frac{5}{8} - \frac{5}{12} = ?$	28. $\frac{5}{8} - \frac{3}{9} = ?$

MULTIPLICATION OF FRACTIONS

OR

FINDING A FRACTIONAL PART OF A FRACTION

EXERCISE 150.—ORAL



Look at this square. $\frac{1}{2}$ of the upper $\frac{1}{2}$ is shaded.

The shaded part is also $\frac{1}{6}$ of the square.

We therefore know that $\frac{1}{3}$ of $\frac{1}{2}$ is $\frac{1}{6}$, or $\frac{1}{3}$ of $\frac{1}{2} = \frac{1}{6}$, hence —

To find a fractional part of a fraction, multiply the numerators together for a new numerator, and the denominators together for a new denominator.

This is often called **Multiplication of Fractions**, and “ \times ” is written in the place of “of”; that is, $\frac{1}{3}$ of $\frac{1}{2}$ may be written $\frac{1}{3} \times \frac{1}{2}$.

EXERCISE 151.—WRITTEN

1. A man owning $\frac{1}{2}$ of a factory sold $\frac{2}{3}$ of his share. What part of the factory did he sell?

2. A truck farmer had a lot containing $\frac{3}{4}$ of an acre. He planted $\frac{1}{2}$ of his lot in strawberries. How much land did he plant in strawberries?

NOTE. If we wish to find the fractional part of a whole number, we write the whole number in the form of a fraction whose denominator is 1, as,

$$\frac{2}{3} \text{ of } \$7 = \frac{2}{3} \text{ of } \$\frac{7}{1} = \$\frac{14}{3} = \$4\frac{2}{3}.$$

3. How much is $\frac{1}{3}$ of 9 pounds?

4. Find $\frac{3}{4}$ of 30 bushels of wheat.

Find:

- | | | |
|-------------------------------------|----------------------------------|---|
| 5. $\frac{3}{4}$ of $\frac{5}{8}$ | $\frac{4}{5}$ of $\frac{7}{8}$ | $\frac{1}{3}$ of $\frac{1}{4}$ of $\frac{1}{2}$ |
| 6. $\frac{2}{3} \times \frac{3}{4}$ | $\frac{1}{3} \times \frac{2}{5}$ | $\frac{1}{2} \times \frac{1}{5} \times \frac{3}{4}$ |
| 7. $\frac{1}{7} \times \frac{2}{5}$ | $\frac{2}{3} \times \frac{4}{7}$ | $\frac{2}{5} \times \frac{3}{5} \times \frac{1}{2}$ |
| 8. $\frac{7}{8}$ of 9 | $\frac{6}{7}$ of 15 | $\frac{3}{4}$ of $\frac{5}{8}$ of 8 |
| 9. $\frac{2}{3}$ of 5 | $\frac{8}{9}$ of 24 | $\frac{4}{5}$ of $\frac{1}{4}$ of 7 |
| 10. $\frac{1}{5}$ of 7 | $\frac{3}{4}$ of 5 | $\frac{1}{2}$ of $\frac{5}{8}$ of 3 |

11. A man bought a lot for \$575 and paid $\frac{4}{5}$ of the amount in cash. How many dollars did he pay in cash?

12. A carpenter agreed to work at the rate of \$18 a week. If he worked only $\frac{2}{3}$ of a week, how much money should he receive?

13. A contractor agreed to build 96 miles of railroad. How many miles had he built when he had completed $\frac{3}{4}$ of the railroad?

14. In the early spring a farmer thought that he would make 250 bales of cotton, but owing to a rainy summer he made only $\frac{2}{3}$ of what he had hoped to make. How many bales did he make?

15. A clerk was sent out to collect bills amounting to \$370. He collected $\frac{4}{5}$ of the amount. How much money did he collect?

16. Find $\frac{2}{3}$ of $\frac{4}{5}$ of \$30.

17. A man wished to buy an automobile that cost \$3250. $\frac{2}{3}$ of the cost of the automobile equaled half the cost of his home. What was the cost of half of his home? What was the whole cost of his home?

FINDING THE FRACTIONAL PART OF NUMBERS

EXERCISE 152. — WRITTEN

FOOD REQUIRED BY A FAMILY

1. If a man requires 7 ounces of roast beef for dinner and a woman requires $\frac{4}{5}$ as much food as a man, how many ounces are required for the wife? (Note page 129.)

2. If a boy 7 years of age requires $\frac{1}{2}$ of the quantity that the father eats, how much roast beef does the boy require?

3. If a girl 14 years of age requires $\frac{7}{10}$ of the quantity required by a man, how much roast beef will she require?

4. A man eats 3 ounces of bread for supper, and $\frac{2}{3}$ of this quantity is required by a child 5 years of age. How much bread should the child eat for supper?

5. If 4 ounces of potatoes are what a man should eat for dinner, how many ounces of potatoes should be eaten by a woman? (See example 1 above.)

6. How many ounces of potatoes should the 14-year-old daughter eat? (See examples 3 and 5 above.)

7. How many ounces of potatoes are required by a boy 7 years of age? (See examples 2 and 5 above.)

8. How many ounces of potatoes are required for a child 5 years of age? (See examples 4 and 5.)

9. How much more bread is required by a boy 7 years of age than one 5 years of age?

ADDITION OF FRACTIONS AND MIXED NUMBERS

EXERCISE 153. — ORAL

A number consisting of a whole number and a fraction is called a **mixed number**, as $2\frac{3}{4}$, $1\frac{2}{3}$.

1. A 3-penny wire nail is $1\frac{1}{4}$ inches long, and a 5-penny nail is $\frac{1}{2}$ inch longer. How long is a 5-penny nail? *

2. A 4-penny nail is $1\frac{1}{2}$ inches long; an 8-penny nail is 1 inch longer. How long is an 8-penny nail?

3. A 6-penny nail is $\frac{1}{2}$ inch longer than a 4-penny nail. How long is a 6-penny nail?

4. A 10-penny nail is $1\frac{1}{2}$ inches longer than a 4-penny nail. How long is a 10-penny nail?

5. A 20-penny nail is $2\frac{3}{4}$ inches longer than a 3-penny nail. How long is a 20-penny nail?

EXERCISE 154. — WRITTEN

1. $2\frac{2}{3} + 3\frac{1}{2} = ?$

OPERATION

EXPLANATION

$2\frac{2}{3} = 2\frac{4}{6}$ Change the fractions to a common denominator, and then add. $\frac{2}{3}$ and $\frac{1}{2}$ are $\frac{4}{6}$ and $\frac{3}{6}$; write $\frac{1}{6}$ under the fractions and add 1 to the whole numbers, etc.

2. $4\frac{3}{4} + 5\frac{2}{3} = ?$ $7\frac{4}{6} + 2\frac{4}{3} = ?$ $5\frac{2}{3} + 6\frac{1}{6} = ?$

3. $4\frac{2}{3} + 7\frac{8}{9} = ?$ $5\frac{4}{6} + 6\frac{2}{3} = ?$ $6\frac{2}{3} + 4\frac{8}{9} = ?$

* The teacher should have samples of nails to show the pupils, to make these problems seem more real.

SUBTRACTION OF FRACTIONS AND MIXED NUMBERS

EXERCISE 155.— WRITTEN

- | | EXPLANATION |
|---------------------------------------|--|
| 1. From $4\frac{1}{2} = 4\frac{4}{8}$ | |
| Take $1\frac{1}{4} = 1\frac{2}{8}$ | (1) Change the fractions to a common denominator and subtract. |
| $3\frac{2}{8}$ | |
| 2. From $7\frac{1}{3} = 7\frac{2}{6}$ | (2) Change fractions to a common denominator. |
| Take $2\frac{1}{2} = 2\frac{3}{6}$ | We cannot subtract $\frac{3}{6}$ from $\frac{2}{6}$. |
| $4\frac{5}{6}$ | Borrow 1 from 7, and regard it as $\frac{6}{6}$. |
| | $\frac{6}{6}$ added to $\frac{2}{6}$ makes $\frac{8}{6}$; $\frac{3}{6}$ from $\frac{8}{6}$ leaves $\frac{5}{6}$. |
| | 2 from 6 leaves 4. |

EXERCISE 156.— WRITTEN

1. Mary's mother used $10\frac{1}{2}$ yards of round thread lace on her dress. She used $4\frac{1}{4}$ yards on the waist. How much did she use on the skirt?
2. She bought $5\frac{1}{3}$ yards of light blue ribbon. She used $1\frac{1}{2}$ yards for hair bows. How much was left for a sash?
3. She used $6\frac{1}{3}$ yards of linen in making Mary's dress. She used $1\frac{3}{4}$ yards for the waist. How much was used in making the skirt?
4. Mary's uncle gave her \$5 with which to buy a hat and a pair of gloves. She gave \$ $3\frac{3}{4}$ for the hat and the remainder for the gloves. How much did she give for the gloves?

5. Frank's mother made him a blouse and overalls. She bought $7\frac{1}{2}$ yards of denim. She used $2\frac{3}{4}$ yards in making the blouse and the remainder in making the overalls. How much did she use for the overalls?

RELATIVE QUANTITY OF FOOD EATEN BY MEMBERS OF A FAMILY

(Taken from Government Publications)

TABLE BASED ON QUANTITY A MAN EATS

A woman requires $\frac{4}{5}$ as much as a man.

A child 3 to 5 years old requires $\frac{3}{5}$ as much as a man.

A child 6 to 9 years old requires $\frac{1}{2}$ as much as a man.

A child 10 to 13 years old requires $\frac{3}{4}$ as much as a man.

EXERCISE 157. — WRITTEN

1. If the father requires 10 ounces of food for breakfast, how many ounces, according to the table, will be required by each member of his family, his wife, a 4-year-old son, a 7-year-old son, and a 12-year-old daughter?

2. What will be the total weight of the food eaten for breakfast by the family?

3. 1 apple is what part of 2 apples? 3 apples are how much more than 2 apples? $\frac{3}{5}$ are how much more than $\frac{2}{5}$?

4. The 10-year-old child eats how much more than the 3-year-old child?

5. How much more does the father eat than the mother? (Note that the father eats $\frac{5}{6}$.)

6. $\frac{1}{5}$ is what part of $\frac{3}{5}$? How much more than the 10-year-old child does the father eat?

MULTIPLICATION OF FRACTIONS AND MIXED NUMBERS

A fraction whose value is less than 1 is called a **Proper Fraction**, as $\frac{1}{3}$, $\frac{3}{4}$.

A fraction whose value is 1, or more than 1, is called an **Improper Fraction**, as $\frac{5}{3}$, $\frac{7}{6}$.

HOW TO CHANGE A WHOLE NUMBER TO AN IMPROPER FRACTION

Change 3 to an improper fraction whose denominator is 5.

$$1 = \frac{5}{5} \text{ and } 3 = 3 \times \frac{5}{5} = \frac{15}{5}.$$

Change 7 to improper fractions with the denominators 1s, 4ths, 7ths, 8ths.

HOW TO CHANGE A MIXED NUMBER TO AN IMPROPER OR MIXED FRACTION

Change $4\frac{1}{3}$ to an improper fraction.

$$4 = 4 \times \frac{3}{3} = 1\frac{2}{3}, \frac{12}{3} + \frac{1}{3} = 1\frac{13}{3}.$$

A short way: *Multiply the whole number by the denominator, and add to the product the numerator of the fraction, and the sum is the numerator of the improper fraction.*

Change to improper fractions :

$$7\frac{1}{2}, \quad 9\frac{3}{4}, \quad 10\frac{7}{8}, \quad 5\frac{4}{5}.$$

HOW TO CHANGE AN IMPROPER FRACTION TO A WHOLE OR MIXED NUMBER

Change $\frac{30}{4}$ to a whole or mixed number.

$1 = \frac{4}{4}$, $\frac{30}{4} =$ as many ones as $\frac{30}{4}$ contains $\frac{4}{4}$,

$$\frac{30}{4} \div \frac{4}{4} = 7\frac{2}{4} = 7\frac{1}{2}.$$

A short way: *Divide the numerator of the improper fraction by the denominator.*

Change to whole or mixed numbers $\frac{45}{2}$, $\frac{37}{8}$, $\frac{47}{9}$, $\frac{18}{15}$.

HOW TO MULTIPLY A MIXED NUMBER BY A WHOLE NUMBER

EXERCISE 158.—WRITTEN

1. Find the cost of 3 hats at $\$2\frac{1}{2}$ apiece.

We know that if 1 hat costs $\$2\frac{1}{2}$, 3 hats will cost 3 times $\$2\frac{1}{2}$.

OPERATION

$$(a) \quad 3 \times \$2\frac{1}{2} = 3 \times \frac{\$5}{2} = \frac{\$15}{2} = \$7\frac{1}{2}, \text{ or,}$$

$$(b) \quad \begin{array}{r} \$2\frac{1}{2} \\ 3 \\ \hline \$7\frac{1}{2} \end{array}$$

Explanation of (b):

3 times $\$ \frac{1}{2} = \$ \frac{3}{2} = \$1\frac{1}{2}$;

3 times $\$2 = \6 ;

add $\$1\frac{1}{2}$, and we have $\$7\frac{1}{2}$.

Find the cost of:

2. 7 pounds of sugar at $6\frac{1}{2}$ cents a pound.

3. 5 yards of gingham at $7\frac{1}{2}$ cents a yard.

4. 9 dozen eggs at $27\frac{1}{2}$ cents a dozen.

5. 4 pairs of shoes at \$3 $\frac{1}{2}$ a pair.

Find the product of :

6. $9 \times 13\frac{1}{2}$

$8 \times 22\frac{1}{2}$

$7 \times 16\frac{2}{3}$

7. $4 \times 8\frac{1}{3}$

$6 \times 12\frac{1}{2}$

$5 \times 87\frac{1}{2}$

HOW TO MULTIPLY A MIXED NUMBER BY A MIXED NUMBER

EXERCISE 159.—WRITTEN

1. What will 5 $\frac{1}{2}$ pounds of sugar cost at 6 $\frac{1}{4}$ cents a pound?

We know that if 1 pound costs 6 $\frac{1}{4}$ cents, 5 $\frac{1}{2}$ pounds will cost 5 $\frac{1}{2}$ times 6 $\frac{1}{4}$ cents, or $5\frac{1}{2} \times 6\frac{1}{4}$ cents.

Change both to improper fractions, and we have

$$5\frac{1}{2} \times 6\frac{1}{4} \text{ cents} = \frac{11}{2} \times \frac{25}{4} \text{ cents} = \frac{275}{8} \text{ cents} = 34\frac{3}{8} \text{ cents.}$$

2. What will a man earn in 4 $\frac{3}{4}$ days if he receives \$2 $\frac{1}{4}$ a day?

3. I bought a chicken weighing 4 $\frac{3}{4}$ pounds and paid 12 $\frac{1}{2}$ cents a pound for it. What did I pay for the chicken?

Find the product of :

4. $2\frac{1}{3} \times 7\frac{1}{2}$

$8\frac{1}{4} \times 7\frac{3}{4}$

$3\frac{1}{2} \times 3\frac{1}{2}$

5. $9\frac{1}{5} \times 6\frac{1}{4}$

$6\frac{1}{2} \times 12\frac{1}{2}$

$8\frac{1}{3} \times 10\frac{1}{4}$

EXERCISE 160.—WRITTEN

WHAT A POUND OF LINT COTTON WILL MAKE

A pound of lint cotton will make either 1 $\frac{1}{2}$ yards of denim, or 4 yards of sheeting, etc., as stated in the examples given below.

F
follo

1

2

3

4

5

6

yard

7

1

1

be

be

c

Find the value of one pound of cotton in each of the following examples :

1. $1\frac{1}{2}$ yards of denim worth 12 cents a yard.
2. 4 yards of sheeting worth 5 cents a yard.
3. 4 yards of bleached muslin worth 8 cents a yard.
4. 7 yards of calico worth 5 cents a yard.
5. 6 yards of gingham worth $7\frac{1}{2}$ cents a yard.
6. 10 yards of shirt waist material worth 15 cents a yard.
7. 10 yards of lawn worth 25 cents a yard.
8. 25 handkerchiefs worth 10 cents each.
9. 56 spools of sewing thread worth 5 cents a spool.
10. What would be the value of the denim that might be made from 8 pounds of cotton ?
11. What would be the value of the gingham that might be made from a bale of lint cotton weighing 500 pounds ?

EXERCISE 161.—ORAL

1. Which of the articles made from a pound of lint cotton has the least value ?
2. Which article has greatest value ?
3. What is the difference in the value of a pound of cotton when it is manufactured into sewing thread and when it is manufactured into denim ?
4. How much more would a pound of cotton sell for if made into lawn than if made into calico ?

NOTE. The teacher may make a large number of problems from the data given above.

DIVISION OF FRACTIONS

HOW TO DIVIDE ONE FRACTION BY ANOTHER

Sometimes division is expressed in the form of a fraction, that is, $3 \div 2$ may be written $\frac{3}{2}$.

Divide $\frac{1}{2}$ by $\frac{1}{3}$, or $\frac{1}{2} \div \frac{1}{3} = ?$ $\frac{1}{2} \div \frac{1}{3} = \frac{3}{2} \div \frac{2}{2}$.

We know that 3 of anything divided by 2 of the same thing may be expressed in the form of the fraction $\frac{3}{2}$.

Hence $\frac{1}{2} \div \frac{1}{3} = \frac{3}{2} \div \frac{2}{2} = \frac{3}{2}$, that is, $\frac{1}{2} \div \frac{1}{3} = \frac{3}{2}$.

From this we learn that

*To divide one fraction by another, change both fractions to a common denominator and divide the numerator of the dividend by the numerator of the divisor.**

EXERCISE 162. — WRITTEN

Divide :

1. $\frac{2}{3}$ by $\frac{1}{2}$ $\frac{3}{4}$ by $\frac{2}{3}$ $\frac{5}{6}$ by $\frac{1}{4}$

2. $\frac{5}{6}$ by $\frac{2}{3}$ $\frac{8}{9}$ by $\frac{2}{7}$ $\frac{7}{8}$ by $\frac{4}{5}$

3. $\frac{7}{8}$ by $\frac{3}{5}$ $\frac{6}{7}$ by $\frac{2}{3}$ $\frac{3}{4}$ by $\frac{1}{7}$

4. A woman sold 2 dozen eggs to a merchant at $\$ \frac{1}{3}$ a dozen and received payment in coffee at $\$ \frac{1}{4}$ a pound. How much coffee did she receive?

* After much practice in this method is given, invert the terms of the divisor and proceed as in multiplication.

HOW TO DIVIDE WHEN BOTH DIVIDEND AND DIVISOR
ARE NOT FRACTIONS

EXERCISE 163.—WRITTEN

If both the dividend and divisor are not fractions, but one of them is a whole number or a mixed number, change to an improper fraction before trying to divide.

1. A bricklayer received \$26 for doing a piece of work. If he was paid at the rate of $\$4\frac{1}{3}$ a day, how long did it take him to do the work?

2. How many yards of cloth at \$2 a yard can be bought for $\$9\frac{1}{2}$?

3. How many barrels of flour may be bought for \$57 if 1 barrel costs $\$7\frac{1}{3}$?

4. If a load of wood costs $\$3\frac{1}{4}$, how many loads may be bought for $\$16\frac{1}{4}$?

5. A merchant owes a customer $87\frac{1}{2}$ cents. How many pounds of sugar at $6\frac{1}{2}$ cents will pay the debt?

6. If a carpenter works for $\$3\frac{1}{4}$ a day, how long will it take him to earn $\$16\frac{1}{4}$?

7. If gingham is worth $7\frac{1}{2}$ cents a yard, how many yards may be bought for 90 cents?

Divide:

- | | | | |
|---|-------------------------------------|-------------------------------------|-------------------------------------|
| 8. $22\frac{1}{2}$ by 8, | $87\frac{1}{2}$ by $2\frac{1}{3}$, | $16\frac{2}{3}$ by $2\frac{1}{2}$, | $42\frac{1}{2}$ by $6\frac{1}{4}$. |
| 9. $12\frac{1}{2}$ by $3\frac{1}{2}$, | 60 by $8\frac{1}{3}$, | 100 by $12\frac{1}{2}$, | 150 by $16\frac{2}{3}$. |
| 10. $9\frac{1}{2}$ by $4\frac{1}{3}$, | 24 by $3\frac{3}{4}$, | $7\frac{1}{5}$ by $2\frac{3}{5}$, | $8\frac{2}{5}$ by $9\frac{1}{2}$. |
| 11. $6\frac{2}{3}$ by $5\frac{9}{10}$, | 15 by $5\frac{1}{2}$, | 7 by $9\frac{3}{4}$, | $7\frac{3}{5}$ by $12\frac{1}{3}$. |
| 12. 25 by $4\frac{1}{2}$, | 32 by $8\frac{1}{3}$, | 72 by $3\frac{1}{8}$, | 44 by $3\frac{1}{2}$. |
| 13. $7\frac{3}{4}$ by $5\frac{1}{2}$, | $5\frac{1}{2}$ by $5\frac{1}{2}$, | $6\frac{6}{8}$ by $6\frac{1}{8}$, | $15\frac{1}{3}$ by $8\frac{1}{3}$. |

EXERCISE 164. — ORAL

Count by 10's from 10 to 100.

Count by 100's from 100 to 1000.

A comma is usually placed between hundreds and thousands, as 10,000.

Count by 1000's from 1000 to 10,000.

How many 10,000's in 20,000? In 30,000? In 40,000? In 50,000?

In the number 54,875, which figure is in the units' place? The tens' place? The hundreds' place? The thousands' place?

See if you can read the following numbers: 54,725; 95,675; 195,675; 100,675.

EXERCISE 165. — WRITTEN

Write in figures: forty-seven; two hundred, forty-seven; three thousand, two hundred, forty-seven; twenty-thousand, two hundred, forty-nine; one hundred and twenty-seven thousand, eight hundred, seventy-five.

Express in figures and then find the sum of:

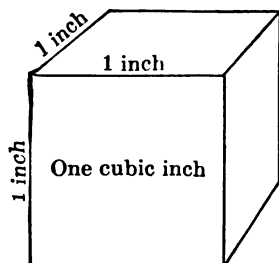
one hundred twenty-five thousand, one hundred, fifty.

one hundred fifty-nine thousand, two hundred, sixty-two.

one hundred eighty-four thousand, six hundred, sixteen.



CUBIC MEASURE



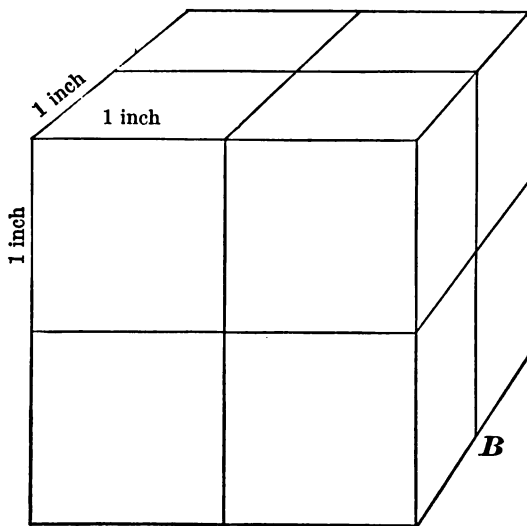
Look at Figure *A*, and tell its length, width, and thickness.

A solid whose length, width, and thickness is 1 inch is called a cubic inch (cu. in.).

A solid whose length, width, and thickness is 1 foot is called a cubic foot (cu. ft.).

A solid whose length, width, and thickness is 1 yard is called a cubic yard (cu. yd.).

Look at Figure *B* and tell its length, width, and



thickness. Notice that it has 8 cu. in. and also that the product of its length, width, and thickness, $2 \times 2 \times 2$, is 8.

We may say then that: *The number of cubic inches in a solid is equal to the product of its length, width, and thickness, when all have the same unit of measure.*

If either one is expressed in inches, the other two must also be expressed in inches.

EXERCISE 166. — WRITTEN

1. What is the length, width, and thickness of a cubic foot when expressed in inches?
2. How many cubic inches in a cubic foot?
3. What is the length, width, and thickness of a cubic yard when expressed in feet?
4. How many cubic feet in a cubic yard?

TABLE

1728 cu. in. make 1 cu. ft.

27 cu. ft. make 1 cu. yd.

5. How many cubic inches in a box 6 in. long, 4 in. wide, and 3 in. deep?
6. How many cubic feet in a room 18 ft. long, 15 ft. wide, and 9 ft. high?
7. How many cubic feet in a cellar 20 feet long, 18 feet wide, and 6 feet deep?
8. How many cubic yards in the cellar given in example 7?
9. How many cubic feet in a brick wall 20 feet long, 2 feet wide, and 8 feet deep?

10. A farmer had a ditch dug that was 450 feet long, 2 feet wide, and $2\frac{1}{2}$ feet deep. How many cubic feet of earth were removed in digging the ditch?

11. How many cubic yards were taken from the ditch given in example 10?

12. How many cubic inches in a box 2 feet long, 18 inches wide, and 1 foot deep?

13. How many cubic feet in a piece of timber that is 12 inches wide, 12 inches thick, and 18 feet long?

THE AIR WE BREATHE

14. 1200 cu. in. of air are made unfit to be breathed by one person in one minute. How many cubic inches are made unfit to be breathed by one person in five minutes?

15. How many cubic inches of air are required for 30 pupils in 1 minute?

16. How many cubic inches of air are required by 30 persons in 1 hour? How many cubic feet?

17. If a child 9 years old sleeps $10\frac{1}{2}$ hours during the night, how many cubic feet of air will he breathe during the night?

18. If the child's bedroom is 15 ft. long, 12 ft. wide, and 9 ft. high, how many cubic feet of air are in the room?

19. How long before the air in his room would be unfit for breathing if no fresh air could get in?

20. How large is your schoolroom?

21. How many pupils are seated in the room?

22. How many minutes will be required to use all of the fresh air in the room?

DECIMALS

EXERCISE 167. — ORAL

Look at these fractions, $\frac{5}{10}$, $\frac{75}{100}$, $\frac{875}{1000}$.

The denominator of the first fraction is 10; of the **second** fraction, 100, or 10×10 ; of the third fraction, 1000, or $10 \times 10 \times 10$.

Fractions whose denominators are 10, or the product of two or more 10's, are called **Decimal Fractions**, or **Decimals**.

Usually a decimal fraction is written without the denominator, but with the numerator and a period (.) called the **decimal point**; thus $\frac{5}{10}$ is written .5 and is read "five tenths."

We read a decimal of

One place as tenths, as	.5	= 5 tenths,
two places as hundredths	.75	= 75 hundredths,
three places as thousandths	.875	= 875 thousandths,
four places as ten-thousandths	.1875	= 1875 ten-thousandths.

EXERCISE 168. — WRITTEN

Express as decimals :

$\frac{7}{10}$	$\frac{75}{100}$	$\frac{125}{1000}$	$\frac{5}{10}$
$\frac{8}{100}$	$\frac{65}{1000}$	$\frac{5}{100}$	$\frac{45}{100}$
$\frac{25}{1000}$	$\frac{3}{10000}$	$\frac{45}{100000}$	$\frac{25}{100000}$

NOTE. When the numerator does not have as many places as is required to express the decimal, prefix ciphers, as $\frac{3}{100} = .03$.

EXERCISE 169.—WRITTEN

Read the following decimals and then write them as Common fractions:

.5	.75	.115	.134	.56
.25	.345	.1875	.2856	.854
.125	.587	.875	.375	.1567

Write as decimals:

9 tenths	2156 ten-thousandths
25 hundredths	875 thousandths
375 thousandths	15 tenths

HOW TO CHANGE A COMMON FRACTION TO A DECIMAL

We have seen that $\frac{1}{2}$ equals .5, which may be obtained by annexing 0 to the numerator, 1, dividing by the denominator, 2, and writing the decimal point before the quotient, .5, as $\begin{array}{r} 2 \overline{)10} \\ .5 \end{array}$. Hence

To change a common fraction to a decimal, annex a cipher to the numerator and divide by the denominator, continue annexing ciphers and dividing until there is no remainder, and point off as many places in the quotient as you have annexed ciphers.

Change the following fractions to decimals:

$\frac{1}{2}$	$\frac{3}{4}$	$\frac{2}{5}$	$\frac{3}{8}$	$\frac{1}{4}$
$\frac{5}{8}$	$\frac{3}{5}$	$\frac{7}{8}$	$\frac{8}{100}$	$\frac{8}{10000}$
$\frac{35}{100}$	$\frac{25}{1000}$	$\frac{4}{5}$	$\frac{24}{100}$	$\frac{6}{100}$
$\frac{6}{8}$	$\frac{10}{12}$	$\frac{36}{48}$	$\frac{7}{8}$	$\frac{27}{72}$
$\frac{3}{24}$	$\frac{12}{48}$	$\frac{25}{100}$	$\frac{7}{35}$	$\frac{2}{36}$
$\frac{7}{28}$	$\frac{15}{20}$	$\frac{18}{45}$	$\frac{9}{24}$	$\frac{11}{44}$

ADDITION OF DECIMALS

EXERCISE 170. — WRITTEN

Since $.5 = .50 = .500$, therefore annexing ciphers to a decimal changes the name of the decimal without changing its value.

1. Find the sum of $.5$, $.45$, $.384$.

EXPLANATION

$.500$	Fractions cannot be added unless their names are alike.
$.450$	Change $.5$ to thousandths by annexing two ciphers,
$.384$	as $.500$. Change $.45$ to thousandths by annexing
<u>1.334</u>	one cipher, as $.450$. Write in a column and add as in whole numbers.

We see that the decimal points are in the same vertical line, and that the ciphers do not affect the sum of the numbers, and might have been omitted. Hence

To add decimals, write the decimals so that the decimal points are in the same vertical line, and add as in whole numbers.

2. Find the sum of $.9$, $.27$, $.135$, $.01$, $.115$.
3. Find the sum of $.3$, $.027$, $.27$, $.008$, $.63$.
4. Find the sum of 4.54 , $.5$, 2.8 , 3.463 , 1.025 .
5. Find the sum of 6.002 , 4.5 , $.7$, 8.95 , 7.375 .
6. Find the sum of 8.501 , 2.25 , 6.1 , $.987$.
7. Find the sum of 75.75 , 1.55 , 67.8 , 9.843 .

HEIGHT IN INCHES OF THE AVERAGE BOY AND GIRL OF
7 YEARS OF AGE, AND THE AVERAGE GROWTH IN INCHES
OF BOTH IN A YEAR

	BOY	GIRL
	46.21 inches high	45.94 inches high
8th year	1.95 inches growth	2.13 inches growth
9th year	1.93 inches growth	1.9 inches growth
10th year	2.12 inches growth	1.81 inches growth
11th year	1.84 inches growth	2.01 inches growth
12th year	1.77 inches growth	3.37 inches growth
13th year	2.39 inches growth	1.59 inches growth
14th year	2.91 inches growth	1.57 inches growth
15th year	1.18 inches growth	1.07 inches growth
16th year	3.22 inches growth	.33 inch growth
17th year	.71 inch growth	.27 inch growth
18th year	.47 inch growth	.02 inch growth

EXERCISE 171. — WRITTEN

1. If a boy is 46.21 inches tall in his seventh year, how tall will he be at 10 years of age? How tall at 15 years of age?

2. How many inches will a boy grow during his ninth, tenth, and eleventh years?

3. How many inches will he grow during his twelfth, thirteenth, and fourteenth years?

4. How tall will a girl be at nine years of age? At twelve?

5. How many inches will she grow during her ninth, tenth, and eleventh years?

6. How many inches will she grow during her fifteenth, sixteenth, and seventeenth years?

EXERCISE 172.—WRITTEN

From .4 take .157.

EXPLANATION

100 Fractions cannot be subtracted unless their names
157 are alike.

Annex two ciphers to .4 and it will then have the
e name (thousandths) that the fraction .157 has. We
write the two fractions as whole numbers and see that
decimal points are in the same vertical line, and that the
ers do affect the result. Hence

*To subtract one decimal from another, write them so that
decimal points are in the same vertical line, and then
tract as in whole numbers.*

	1.	2.	3.	4.	5.
From	.9	.5	.75	.4	.1
Take	<u>.76</u>	<u>.25</u>	<u>.09</u>	<u>.375</u>	<u>.008</u>

	6.	7.	8.	9.	10.
From	2.5	6.4	3.75	2.25	18.75
Take	<u>1.75</u>	<u>.75</u>	<u>.36</u>	<u>.875</u>	<u>4.006</u>

EXERCISE 173.—ORAL

FOOD

Some of the foods we eat make the bone and muscle of
bodies and are called *tissue builders*.

In the following table are given some of the foods that

build up our bodies and the amount of tissue-building food in a pound.

Read the table over carefully.

Sweet milk	in 1 lb. has	.25 tissue-building food
Buttermilk	in 1 lb. has	.35 tissue-building food
Cheese	in 1 lb. has	.39 tissue-building food
Round beef	in 1 lb. has	.57 tissue-building food
Wheat bread	in 1 lb. has	.15 tissue-building food
Potatoes	in 1 lb. have	.10 tissue-building food
Apples	in 1 lb. have	.03 tissue-building food

1. Which is the greatest tissue builder in the list?
2. Which is the least tissue builder?
3. How much more tissue-building food in a pound of buttermilk than in a pound of sweet milk?
4. How much more tissue-building food in a pound of cheese than in a pound of sweet milk?
5. How much more tissue-building food in bread than in apples?
6. How much more in bread than in potatoes?
7. How much more in buttermilk than in bread?
8. How much more in sweet milk than in bread?

EXERCISE 174.—WRITTEN

TABLE SHOWING THE WEIGHT OF THE AVERAGE BOY AND GIRL FROM THE SEVENTH TO THE EIGHTEENTH YEAR

Age	BOY Weight	GIRL Weight
7 years	49.47 pounds	48.02 pounds
8 years	54.43 pounds	52.93 pounds
9 years	59.97 pounds	57.52 pounds

Age	Boy Weight	GIRL Weight
10 years	66.62 pounds	64.09 pounds
11 years	72.39 pounds	70.26 pounds
12 years	79.82 pounds	81.35 pounds
13 years	88.26 pounds	91.18 pounds
14 years	99.28 pounds	100.32 pounds
15 years	115.84 pounds	108.42 pounds
16 years	123.67 pounds	112.94 pounds
17 years	128.72 pounds	115.84 pounds
18 years	132.71 pounds	115.80 pounds

1. If a boy 6 years old weighs 45.14 lb. and at 9 years of age weighs 59.97 lb., what does he gain in weight in three years?

2. If a girl at 6 years of age weighed 43.81 lb., and at 9 years of age weighed 57.52 lb., what was her gain in three years?

3. If a boy gains in weight 4.33 lb. during his seventh year, and a girl during her seventh year gains 2.26 lb., how much more does the boy gain than the girl?

4. Look at the above table and find how much more a boy 18 years of age weighs than a girl of the same age.

5. According to the table, how much should you weigh? How much do you weigh? What is the difference between your actual weight and the average weight for one of your age?

6. What is the difference in weight between a boy 10 years of age and a girl of the same age?

7. John is just 15 years old and he weighs 120.75 pounds. How much heavier than the average boy is he?

MULTIPLICATION OF DECIMALS

EXERCISE 175.—ORAL

Let us find the product of $3 \times .4$.

$$3 \times .4 = 3 \times \frac{4}{10} = \frac{12}{10} = 1.2, \text{ that is, } 3 \times .4 = 1.2$$

Let us find the product of $.3 \times .4$.

$$.3 \times .4 = \frac{3}{10} \times \frac{4}{10} = \frac{12}{100} = .12, \text{ that is, } .3 \times .4 = .12$$

Let us look at the two expressions,

$$3 \times .4 = 1.2$$

$$.3 \times .4 = .12$$

In the first expression there is one decimal place in the multiplicand and multiplier ($3 \times .4$) and one decimal place in the product (1.2).

In the second expression there are two decimal places in the multiplicand and multiplier ($.3 \times .4$) and two in the product (.12). Hence

To multiply decimals, multiply as in whole numbers and point off as many decimal places in the product as there are decimal places in both the multiplier and multiplicand.

NOTE. If there are not as many places in the product as there are in both the multiplier and multiplicand, prefix ciphers, as $.4 \times .06 = .024$.

EXERCISE 176.—WRITTEN

Multiply:

1. $.42$ by $.7$

2. $.042$ by 7

3. $.42$ by 7

MODEL

$$.42$$

$$.7$$

$$\hline .294$$

$$147$$

4. 6.5 by $.25$

5. 52.5 by $.375$

6. 2.48 by 1.5

Milk, butter, and cream contain certain portions of water, fat, etc.

The following table shows how much water, fat, etc., milk, butter, and cream contain.

	MILK	SKIMMED MILK	BUTTERMILK	CREAM
Water . . . . .	.87	.905	.91	.74
Fat . . . . .	.04	.003	.005	.185
Ash . . . . .	.007	.007	.007	.005
Tissue-building Food	.033	.034	.03	.034

EXERCISE 177.—WRITTEN

1. What is the weight of the water in 8.5 pounds of milk? In 7.75 pounds of skimmed milk? In 6.5 pints of buttermilk? In 9.5 pints of cream? *
2. How much fat in 12.75 pints of skimmed milk? In 8.25 pints of buttermilk? In 10.5 pounds of cream?
3. How much ash in 12.5 pints of milk? In 10.4 pints of skimmed milk? In 8.5 pints of buttermilk?
4. How much tissue-building food in 7.8 pounds of milk? In 16 pints of skimmed milk? In 5.25 pints of buttermilk? In 1.37 pints of cream?
5. How much tissue-building material in 2 pounds of buttermilk? In 2 pints of milk?
6. What part of 8 pints of cream is water?
7. What is the weight of the water in 20 pounds of cream?
8. How many pints of water in 16 pints of buttermilk?

* In these examples 1 pint is roughly estimated as weighing 1 pound.

DIVISION OF DECIMALS

EXERCISE 178.—WRITTEN

1. $.12 \div .3 = ?$

SOLUTION

We know that $3 \times 4 = 12$, and that

$$12 \div 3 = 4,$$

and

$$12 \div 4 = 3;$$

that is, if you divide 12, the product of 3×4 , by either 3 or 4, the quotient will be the other number. Hence

Since $.3 \times .4 = .12$,

$$(a) .12 \div .3 = .4,$$

and

$$(b) .12 \div .4 = .3.$$

In (a) and (b) the dividend, .12, has one more decimal place than the divisor, and the quotient has only one decimal place. Hence

To divide one decimal by another, divide as in whole numbers and point off as many places in the quotient as those in the dividend exceed those in the divisor.

If the dividend does not have as many places as the divisor, annex ciphers until there are as many in the dividend as in the divisor. If the dividend has no decimal places, annex as many as there are in the divisor.

2. Divide .425 by .25; 4.5 by 2.5; 42.5 by 25.

3. Divide 7.7 by .35; .77 by .11; .77 by 3.5.

4. Divide 6.25 by .25; .625 by .025; 6.5 by .025.

5. Divide 1.68 by 1.2 ; .168 by .12 ; 16.8 by 4.2.
6. 2.3 lb. of round beef are equal, as a tissue builder, to 6.21 quarts of milk. One pound of beef equals how much milk ?
7. 4.7 lb. of mutton are equal, as a tissue builder, to 9.4 quarts of milk. How many quarts of milk is 1 pound of mutton equal to ?
8. If 5.7 lb. of fresh pork equal, in food value, 11.97 quarts of milk, 1 pound of pork equals how much milk ?
9. If 8.5 pounds of smoked ham are equal, as a tissue builder, to 17 quarts of milk, 1 pound of smoked ham is equal to how much milk ?
10. A chicken weighing 4.64 lb. is equal, in food value, to 10.208 quarts of milk. One pound of chicken is equal to how many quarts of milk ?
11. If 9.5 pounds of bacon cost \$2.1375, what will 1 pound cost ?
12. A steamer went 123.25 miles in 8.5 hours. How many miles did it go in 1 hour ?
13. A field of 12.5 acres produced 21.875 bales of cotton. How many bales did 1 acre produce ?
14. The product of two numbers is .966, and one of the numbers is .23. Find the other number.
15. If 25.5 acres produce 1912.5 bushels of corn, what does one acre produce ?
16. How many cans holding 4.75 gallons each may be filled with oil from a cask that contains 14.25 gallons ?
17. The product of two numbers is .1961, and one of the numbers is .37. Find the other number.

MEASURING HEAT

EXERCISE 179.—ORAL

When we wish to know how warm it is, we look at a thermometer. Heat is measured by degrees. A degree is marked thus $^{\circ}$.

1. Can you tell how warm it is out of doors to-day?

2. When the thermometer shows 70 we say that the temperature is 70° .

3. Water freezes at 32° and boils at 212° . How many degrees difference in temperature between the freezing and boiling points?

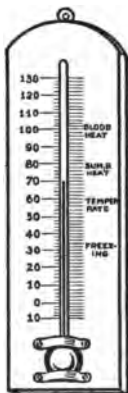
4. The temperature of the human body is 98° , which is called the normal temperature.

5. James is ill and has 3° of fever. What is his temperature?

6. Frank has typhoid fever. At 6 o'clock in the morning his temperature was 99° ; at 2 o'clock in the afternoon it was 104. How many degrees of fever had he in the afternoon?

7. At 2 o'clock in the afternoon his mother gave him a cold sponge bath which reduced his temperature 5 degrees. What was his temperature after the bath?

8. How many degrees difference is there between the normal temperature of the human body and the point at which water freezes?



PERCENTAGE

EXERCISE 180.—ORAL

NOTE. Four per cent is another name for four hundredths, or .04. % is the sign of per cent.

1. 100 beans were planted and only 96 of them grew. How many hundredths grew? How many hundredths failed to grow?

2. Read the following:

twenty-five hundredths; .25; 25 %.

3. A twig has 100 buds, 5 of which are killed by the frost. How many hundredths are killed? What per cent are killed?

4. I examined 100 maple leaves and found that 15 of them had been eaten by insects. How many hundredths had been eaten? What per cent of the leaves had been eaten?

5. James set out 100 cabbage plants. 10 of them were eaten by worms. How many hundredths did the worms eat? What per cent of the cabbage plants did the worms eat?

EXERCISE 181.—WRITTEN

TO FIND A CERTAIN PER CENT OF ANY NUMBER

1. Find 9 % of \$425.

SOLUTION

9 % of any number is .09 of that number.	\$425.00
9 % of \$425.00 is .09 of \$425.00, and	.09
09 of \$425.00 is .09 \times \$425.00.	<hr/> \$38.2500

Hence

To find a certain per cent of any number we multiply that number by the per cent expressed as a decimal.

Apple trees should be sprayed to keep the fruit from being wormy.

2. A sprayed tree had 3500 apples on it. 5% of the apples were wormy. How many apples were wormy?

3. An unsprayed tree had 3420 apples, 20% of which were wormy. How many were wormy?

4. A farmer made 1575 bales of cotton one year, and the next year he made 12% more. How many more bales did he make the second year?

5. A public school enrolled 750 pupils on Monday. On Tuesday there was an increase of 8%. How many new pupils came on Tuesday?

6. The sound apples on the sprayed tree (see examples 2 and 3) brought \$1.25 a bushel. The sound apples on the unsprayed tree were smaller and sold for only 40% of what the sound apples on the sprayed tree sold for. What did they bring a bushel?

EXERCISE 182.—WRITTEN

WHAT OUR BODIES ARE COMPOSED OF

1. The human body is composed of:

Protein	18%	Fat	15%
Carbohydrates	1%	Ash	6%

The remainder is water.

What per cent of the body is water?

2. A boy 9 years old and weighing 59.97 pounds should have how many pounds of protein in his body tissue?

How many pounds of fat? How many pounds of ash?
How many pounds of carbohydrate? How many pounds
of water?

3. A girl 9 years old and weighing 57.52 pounds should have how many pounds of protein in her body tissue? How many pounds of fat? How many pounds of carbohydrate? How many pounds of ash?

EXERCISE 183. — ORAL

The equivalent per cent of each of the following fractions should be known so well that you will recall it the moment the fraction is mentioned.

Read the fraction, the decimal fraction, and the equivalent per cent:

$$\frac{1}{2}, \text{ or } .50 = 50\%$$

$$\frac{1}{6}, \text{ or } .16\frac{2}{3} = 16\frac{2}{3}\%$$

$$\frac{3}{8}, \text{ or } .33\frac{1}{3} = 33\frac{1}{3}\%$$

$$\frac{1}{8}, \text{ or } .12\frac{1}{2} = 12\frac{1}{2}\%$$

$$\frac{1}{4}, \text{ or } .25 = 25\%$$

$$\frac{1}{10}, \text{ or } .10 = 10\%$$

$$\frac{1}{5}, \text{ or } .20 = 20\%$$

1. A boy gave one half of his money for a knife. What per cent of his money did he give for the knife?

2. If you have 15 marbles and give 10 of them to your brother, how many do you have left? What part of them do you have left? What per cent do you have left?

3. A man had \$8 and gave \$2 for a hat. What part of his money did he give for the hat? What per cent of his money did he give for the hat?

4. From a piece of cloth 18 yards long a clerk sold 15 yards. How many yards remained unsold? What part of the piece remained unsold? What per cent remained unsold?

5. A little girl having 5 cents gave 1 cent for a pencil. What part of her money did she give for the pencil? What per cent of her money did she give for the pencil?

6. I gave \$48 for a wagon and sold it for \$42. How many dollars did I lose? What part of the cost did I lose? What per cent of the cost did I lose?

7. An article that cost 40 cents was sold for 35 cents. How many cents were lost? What part of the cost was lost? What per cent of the cost was lost?

8. A child that weighed 60 pounds now weighs 66 pounds. How many pounds has he gained? What part of the 60 pounds has he gained? What per cent of the 60 pounds has he gained?

EXERCISE 184. — ORAL

What part of the cost do you gain if you buy anything for

1. 4 cents and sell it for 6 cents?
2. 4 cents and sell it for 5 cents?
3. 5 cents and sell it for $7\frac{1}{2}$ cents?
4. 12 cents and sell it for 14 cents?
5. 12 cents and sell it for 15 cents?
6. 12 cents and sell it for 16 cents?
7. 10 cents and sell it for 12 cents?
8. 8 cents and sell it for 9 cents?
9. 10 cents and sell it for 11 cents?
10. 24 cents and sell it for 32 cents?
11. 24 cents and sell it for 28 cents?
12. 24 cents and sell it for 26 cents?
13. 20 cents and sell it for 24 cents?

14. 24 cents and sell it for 27 cents?
15. 50 cents and sell it for 55 cents?
16. 36 cents and sell it for 39 cents?

After each of the above has been solved, substitute "per cent" for "part," read, and solve as follows :

"What per cent do you gain if you buy anything for 4 cents and sell it for 6 cents? If you buy it for 4 cents and sell it for 6 cents, you gain 2 cents. 2 cents, the gain, is $\frac{1}{2}$ of 4 cents, the cost, and since it is $\frac{1}{2}$ of the cost, it is 50 per cent of the cost."

EXERCISE 185. — ORAL

What part of the cost do you lose if you buy anything for

1. 6 cents and sell it for 3 cents?
2. 20 cents and sell it for 18 cents?
3. 12 cents and sell it for 8 cents?
4. 12 cents and sell it for 10 cents?
5. 10 cents and sell it for 8 cents?
6. 16 cents and sell it for 14 cents?
7. 20 cents and sell it for 15 cents?
8. 24 cents and sell it for 22 cents?
9. 12 cents and sell it for 6 cents?
10. 24 cents and sell it for 20 cents?
11. 40 cents and sell it for 36 cents?
12. 5 cents and sell it for 4 cents?
13. 8 cents and sell it for 6 cents?
14. 32 cents and sell it for 28 cents?
15. 36 cents and sell it for 33 cents?
16. 15 cents and sell it for 10 cents?

After each of the above has been solved, substitute "per cent" for "part," read, and solve as follows:

"What per cent of the cost do you lose if you buy anything for 6 cents and sell it for 3 cents? If you buy it for 6 cents and sell it for 3 cents, you lose 3 cents. 3 cents, the loss, is $\frac{1}{2}$ of the cost, and therefore you lose 50 per cent of the cost."

EXERCISE 186. — ORAL

What part of the cost do you gain or lose if you buy anything for

1. 20 cents and sell it for 30 cents?
2. 15 cents and sell it for 12 cents?
3. 36 cents and sell it for 42 cents?
4. 6 cents and sell it for 4 cents?
5. 60 cents and sell it for 54 cents?
6. 30 cents and sell it for 40 cents?
7. 50 cents and sell it for 25 cents?
8. 40 cents and sell it for 50 cents?
9. 60 cents and sell it for 50 cents?
10. 60 cents and sell it for 66 cents?
11. 40 cents and sell it for 48 cents?
12. 48 cents and sell it for 56 cents?
13. 36 cents and sell it for 24 cents?
14. 72 cents and sell it for 78 cents?
15. 40 cents and sell it for 32 cents?
16. 18 cents and sell it for 15 cents?

After each of the above has been solved, substitute "per cent" for "part," read, and solve as follows:

"What per cent do you gain or lose if you buy anything for 20 cents and sell it for 30 cents? If you buy it

for 20 cents and sell it for 30 cents, you gain 10 cents. 10 cents, the gain, is $\frac{1}{2}$ of 20 cents, the cost, and therefore you gain 50 per cent of the cost."

EXERCISE 187. — WRITTEN

Solve the following examples in two ways:

1. Find 50 % of \$48.24.

$$(a) \ 50 \% \text{ of } \$48.24 = \frac{1}{2} \text{ of } \$48.24 \qquad \begin{array}{r} 2) \$48.24 \\ \$24.12 \end{array}$$

$$(b) \ 50 \% \text{ of } \$48.24 = .50 \text{ of } \$48.24 \qquad \begin{array}{r} \$48.24 \\ .50 \\ \hline \$24.1200 \end{array}$$

2. Find $33\frac{1}{3} \%$ of 482 apple trees.
3. 25 % of a farm containing 64 acres.
4. 25 % of 12,350 bales of cotton.
5. $16\frac{2}{3} \%$ of \$720.
6. $12\frac{1}{2} \%$ of 54 bushels of wheat.
7. 10 % of 3786 bushels of corn.
8. 20 % of 10,500 votes.
9. $16\frac{2}{3} \%$ of 240 acres.
10. $33\frac{1}{3} \%$ of 36 marbles.
11. $12\frac{1}{2} \%$ of 72 bales of cotton.
12. 50 % of 25,000 soldiers.
13. 25 % of 350 barrels of flour.
14. 75 % of 500 bushels of meal.
15. $12\frac{1}{2} \%$ of 1648 pupils.
16. $33\frac{1}{3} \%$ of 9420 citizens.
17. $66\frac{2}{3} \%$ of \$150.

ALIUOT PARTS OF ONE DOLLAR

EXERCISE 188. — ORAL

50 cents = $\frac{1}{2}$ of \$1	16 $\frac{2}{3}$ cents = $\frac{1}{6}$ of \$1
33 $\frac{1}{3}$ cents = $\frac{1}{3}$ of \$1	12 $\frac{1}{2}$ cents = $\frac{1}{8}$ of \$1
25 cents = $\frac{1}{4}$ of \$1	10 cents = $\frac{1}{10}$ of \$1
20 cents = $\frac{1}{5}$ of \$1	8 $\frac{1}{3}$ cents = $\frac{1}{12}$ of \$1

This table shows that if the price of 1 article is 50 cents, 2 cost \$1; if the price of 1 article is 33 $\frac{1}{3}$ cents, 3 cost \$1; if the price of 1 article is 25 cents, 4 cost \$1. That is, at 50 cents apiece, every 2 cost \$1; at 33 $\frac{1}{3}$ cents apiece, every 3 cost \$1; at 25 cents apiece, every 4 cost \$1. Hence, to find the cost of any number of articles when the price of one is an aliquot part of a dollar :

Divide the number of articles by the number that cost one dollar, and the quotient will be the cost in dollars.

EXERCISE 189. — WRITTEN

1. At 50 cents a yard, what will be the cost of 8 yards of cloth? 10 yards? 11 yards? 15 yards?
2. At 33 $\frac{1}{3}$ cents a yard, what will be the cost of 6 yards of cloth? 7 yards? 8 yards? 9 yards? 10 yards? 15 yards? 22 yards?
3. At 25 cents each, what is the cost of 8 books? 12 books? 17 books? 20 knives? 26 panes of glass? 30 pounds of butter?

4. At $16\frac{2}{3}$ cents a dozen, what is the cost of 12 dozen eggs? 19 dozen? 25 dozen? 26 dozen? 37 dozen? 50 dozen?

5. At $12\frac{1}{2}$ cents each, find the cost of 8 copy books, 9 copy books, 16 copy books, 17 copy books, 18 copy books, 41 copy books, 50 copy books.

6. At $8\frac{1}{3}$ cents a pound, what is the cost of 13 pounds of rice? 24 pounds? 37 pounds? 86 pounds?

What is the cost of:

7. 15 ducks at $33\frac{1}{3}$ cents apiece? At 20 cents?

8. 25 yards of gingham at $12\frac{1}{2}$ cents a yard? Of 65 yards?

9. What must I pay for 75 pounds of bacon at $8\frac{1}{3}$ cents a pound?

10. What must be paid for a tub of mackerel weighing 15 pounds, worth $16\frac{2}{3}$ cents a pound?

11. What shall I have to pay for 33 quarts of milk if 1 quart costs $12\frac{1}{2}$ cents?

12. What will a 20-pound turkey cost at $33\frac{1}{3}$ cents a pound?

13. If a pound of sugar costs $8\frac{1}{3}$ cents, what will 25 pounds cost?

Find the cost of:

14. 15 meals at $33\frac{1}{3}$ cents a meal.

15. 28 yards of cloth at $33\frac{1}{3}$ cents a yard.

16. 18 pounds of candy at $33\frac{1}{3}$ cents a pound.

17. 32 hours' work at $12\frac{1}{2}$ cents an hour.

18. 12 pairs of socks at $8\frac{1}{3}$ cents a pair.

REVIEW PROBLEMS

EXERCISE 190.— ORAL

HOURS REQUIRED FOR SLEEP

1. A child 9 years old requires $10\frac{1}{2}$ hours' sleep a day, and a boy 14 years old requires 10 hours' sleep a day. How much more sleep is required by a boy 9 years old than by a boy 14 years old ?

2. A boy 17 years old requires $9\frac{1}{2}$ hours' sleep a day. A man 21 years old requires 9 hours' sleep a day. How much more sleep a day is required by the boy of 17 than by the man of 21 ?

3. A person 28 years old requires 8 hours' sleep a day. How much more sleep is required by a person 17 years old than by one who is 28 years old ?

4. A child 4 years old requires 12 hours' sleep a day. How much more sleep is required by a child 4 years old than by one who is 9 years old ?

5. A child 7 years old requires 11 hours' sleep a day. How much more sleep is required by a child 7 years of age than by one 9 years of age ?

6. How much more sleep is required by a child 4 years old than by a person 17 years old ?

7. How much more sleep is required by a child 9 years old than by a person 17 years old ?

8. How many more hours' sleep a day does a 9-year-old child require than a 21-year-old man?

EXERCISE 191. — WRITTEN

THE GARDEN TOAD

1. The garden toad is useful because it destroys insects. In one day a toad was known to destroy 24 cutworms, 24 bugs, 36 ants, 4 weevils, and 20 thousand-legged worms. How many insects in all did the toad destroy that day?

2. How many insects, at that rate, could a toad destroy in a week? How many in the month of July?

3. A toad has been known to catch 86 house flies in 10 minutes. How many was that a minute?

4. How many would a toad destroy in an hour?

5. A toad was known to destroy 55 cutworms in 3 hours. How many was that in an hour?

6. Gardeners sometimes pay children 1 cent each for destroying cutworms. At this price for destroying cutworms, how much would the toad in the above example earn in an hour?

7. English gardeners pay \$25 per 100 for young toads for their gardens. How much, then, are toads worth apiece?

8. It is known that a single toad by destroying insects is able to save to the farmer crops valued at \$2 a year. The toad sometimes lives to be 15 years old. At this rate, how much money would a toad earn in a lifetime?

9. Two boys were known to kill 17 toads in one afternoon. At the value given in problem 8, what was the annual loss to the farmer by the death of these toads?

EXERCISE 192.— WRITTEN**IMPORTANT DATES**

1. Virginia Dare was born on Roanoke Island in 1587. How many years ago was she born ?

2. Peregrine White, the Pilgrim baby, was born in 1620. How long after the birth of Virginia Dare was Peregrine White born ?

3. George Washington was born in 1732. How long was this after the birth of Virginia Dare ?

Find the difference in the dates of birth of the following men :

4. George Washington and Benjamin Franklin, 1706.

5. H. W. Longfellow, 1807, and George Washington.

6. Daniel Boone, 1735, and Andrew Jackson, 1767.

7. Thomas Jefferson, 1743, and John Adams, 1735.

8. Eli Whitney, 1765, and Thomas A. Edison, 1847.

9. Robert Fulton, 1765, and Elias Howe, 1819.

Find the difference between the dates of the following events :

10. The invention of the cotton gin in 1793 and of the phonograph in 1877.

11. The first steamboat on the Hudson in 1807 and the invention of the sewing machine in 1846.

12. The first successful telegraph line between Baltimore and Washington in 1844 and the laying of the Atlantic cable in 1858.

REVIEW PROBLEMS

EXERCISE 193.—WRITTEN

Find the number of days required for each of these flowers to produce their blooms:

	WHEN PLANTED	WHEN THEY WILL BLOOM
1. China Aster,	May 1	August 1
2. Hollyhock,	May 1	July 1
3. Marigold,	Feb. 1	July 1
4. Nasturtium,	Mar. 1	July 1
5. Poppy,	May 10	June 1

EXERCISE 194.—WRITTEN

In the following table the distance between plants and the width of the rows are given.

PLANT	DISTANCE BETWEEN PLANTS	WIDTH OF ROW
Sweet Alyssum	6 inches	12 inches
China Aster	8 inches	12 inches
Nasturtium	12 inches	24 inches
Scarlet Sage	12 inches	12 inches
Sweet Pea	18 inches	36 inches
Zinnia	12 inches	18 inches
Pansy	6 inches	12 inches

1. How wide a space will be required for 3 rows of each of the above-named plants?

2. I want to plant a row of each of the above-named plants, and I want each row to have 24 plants in it. How long will each row be?

NUTS AS FOOD

TABLE OF PER CENTS

	REFUSE	WATER	PROTEIN *
Chestnut	15 $\frac{7}{10}$ %	43 $\frac{3}{8}$ %	6 $\frac{3}{8}$ %
Hickory nut	62 $\frac{1}{5}$ %	3 $\frac{7}{10}$ %	15 $\frac{3}{8}$ %
Walnut	58 $\frac{4}{5}$ %	3 $\frac{3}{8}$ %	18 $\frac{1}{8}$ %
Peanut	27 $\frac{1}{2}$ %	7 $\frac{3}{8}$ %	29 $\frac{4}{5}$ %
Pecan	50 $\frac{1}{10}$ %	3 $\frac{3}{8}$ %	12 $\frac{1}{10}$ %
Butternut	86 $\frac{3}{8}$ %	4 $\frac{1}{2}$ %	30 %

NOTE. The refuse is mainly the shell.

EXERCISE 195.—ORAL

1. Which nut has the most refuse? Which has the least?
2. Which nut contains the most water? Which the least?
3. Which contains the most tissue-building food? Which the least?
4. How much more protein in the hickory nut than in the chestnut?
5. How much more water in the hickory nut than in the walnut?
6. How much more water in the peanut than in the pecan?

* Tissue-building food.

EXERCISE 196. — WRITTEN

1. How many ounces of refuse in 3.5 lb. of each of the nuts in the above list?
2. How much water in 2.75 lb. of each kind?
3. How many ounces of protein in 10.75 lb. of each kind?

EXERCISE 197. — WRITTEN**BIRD FEEDING**

1. A pair of birds were known to work 16 hours every day for two weeks until their little ones were ready to leave the nest. How many hours did they work?
2. They had a family of ten and were known to carry 2000 caterpillars to their nest in a single day. How many caterpillars did each little bird receive?
3. How many caterpillars did the parent birds find in each hour?
4. Another bird was known to feed her little ones 16 times in a single day. At this rate, how many meals must the mother bird provide in two weeks?
5. A flycatcher was seen to carry a mouthful of small flies to her nest every five minutes. How many trips to her nest would she make in a 16-hour day?
6. If the distance is 50 yards for each trip each way, how many yards would the bird fly in a day?

SUPPLEMENTARY PRACTICE

To those teachers who may desire additional practice for their classes, the following devices and suggestions are offered.

Teachers may turn from any page in the body of the book to these exercises whenever the class seems to need special drill.

ADDITION

EXERCISE 198.—ORAL

Draw on the board any one of the following diagrams. Let the first pupil begin at any place and add around the

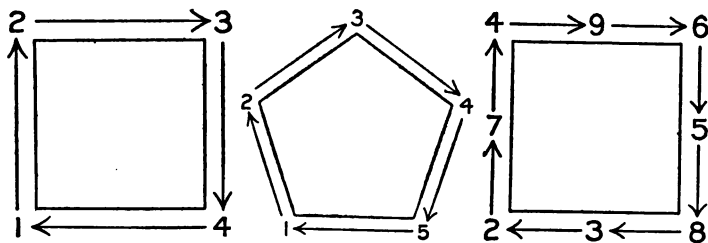


diagram in the direction indicated by the arrows ; let the second pupil begin at the same place and add in the opposite direction ; let the third pupil begin at the next place and add in the direction of the arrows, etc. Frequently the addition need not be carried on farther than once around the diagram. Aim at *accuracy first* and then at *rapidity*.

EXERCISE 199. — ORAL

Write this column of figures on the board and let the pupils, in turn, begin at any figure below the 1 midway of the column and add until that figure is reached again, as:

TEACHER: John, begin at the lower 1 and add to the second 1.

JOHN: (Pointing to each figure as he adds)
One, six, fifteen, etc., — thirty-nine, forty-five.

TEACHER: William, begin at the lower 5 and add to the second 5.

WILLIAM: (Pointing to each figure as he adds)
Five, fourteen, eighteen, etc., — forty-four, forty-five.

After additions have been made from each figure below the 1 midway the column, let additions be made from each figure above the 1 midway the column, down the column, until that figure is reached again.

In this way 18 different additions may be had, the sum of each addition being just 45.

EXERCISE 200. — WRITTEN

FOR DICTATION

TEACHER: Write on the board the letters

A *B* *C*

Under *A* write 235; under *B*, 456; under *C*, 147; under *A*, 352; *C*, 275; *B*, 876; *A*, 251; *C*, 523; *B*, 452; draw a line and add.

The examples when written by the class should be as follows:

<i>A</i>	<i>B</i>	<i>C</i>
235	456	147
352	876	275
<u>251</u>	<u>452</u>	<u>523</u>
1838	1784	945

Calling the several amounts in irregular order forces pupils to give close attention.

Other examples may be given with *D*, *E*, *F*, or any other letters.

Frequently, owing to defective hearing, the pupil will write the wrong figures, and yet the addition of the figures that he has written may be correct. The teacher should inspect all work and be very careful not to mark such additions as incorrect.

EXERCISE 201. — WRITTEN

FOR DICTATION

Dictate for addition columns of hundreds or thousands which contain only the figures 1, 2, 3, 4, and 5, and let there be only four numbers in each column, as :

245	5312	1243	321	231
521	1453	4532	145	315
132	4214	3214	132	452
<u>322</u>	<u>3545</u>	<u>1553</u>	<u>421</u>	<u>134</u>

When the pupils have completed the work, call on different pupils to recite, as :

TEACHER: John may add the numbers in the first example.

JOHN: Two, four, five, ten ; naught and carry one.
One, three, six, eight, twelve ; two and carry one. One, four, five, ten, twelve, etc.

Gradually increase the columns from four numbers to six, eight, and ten numbers, and always use 1, 2, 3, 4, and 5.

Dictate for addition columns of four numbers of hundreds or thousands that contain the figures 1, 3, 5, 7, 8, 9, as :

531	9753	18,357	359	9715
987	7598	39,581	715	3978
395	1389	73,981	891	1587
<u>139</u>	<u>8917</u>	<u>95,379</u>	<u>983</u>	<u>3151</u>

Call on individual pupils to recite, as in the preceding examples.

MULTIPLICATION

EXERCISE 202.—WRITTEN

Frequent use of the following device will give fine practice in multiplication.

Write on the board the figures from 2 to 9 in any order (*M*), and separate them into groups *A*, *B*, *C*, *D*, *E*, and *F*.

Write on the board the figures from 2 to 9 in a different order (*N*), and separate them into groups *a*, *b*, *c*, and *d*.

	<i>A</i>	<i>B</i>	<i>C</i>
(<i>M</i>)	<u>2 9 8</u>	<u>5 7 4</u>	<u>6 3</u>
	<i>D</i>	<i>E</i>	<i>F</i>

$$(N) \quad \underbrace{8 \ 3 \ 9 \ 2}_a \ \underbrace{6 \ 4}_b \ \underbrace{5 \ 7}_c \ \underbrace{}_d$$

MODEL

298

Let the class multiply each group in (*M*) by each group in (*N*); as for group *A* (298) multiplied by group *a* (83), see Model.

83

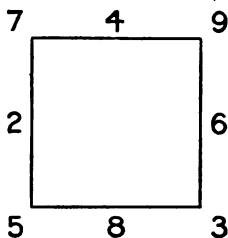
894

2384

24734

EXERCISE 203.—ORAL

For oral drill, draw a square on the board and write the figures 2 to 9 in any order, as seen in the diagram.



TEACHER: John may multiply by 4, once around the square, beginning at 5.

JOHN: Four times five are twenty, four times two are eight, etc.

TEACHER: Henry may multiply by 4, once around the square in the opposite direction, beginning at 5.

HENRY: Four times five are twenty, four times eight are thirty-two, etc.

Continue this practice by multiplying by any figure, in both directions, from any figure of the diagram as a starting point.

EXERCISE 204.—ORAL

Count by 2's from 20 to 24.

Count by 3's from 30 to 36.

Count by 4's from 40 to 48.

Count by 5's from 50 to 60.

Count by 6's from 60 to 72.

Count by 7's from 70 to 84.

Count by 8's from 80 to 96.

Count by 9's from 90 to 108.

Count by 10's from 100 to 120.

Count by 11's from 110 to 132.

Count by 12's from 120 to 144.

1. How many are 10×2 ? 11×2 ? 12×2 ?
How many 2's in 20? In 22? In 24?
2. How many are 10×3 ? 11×3 ? 12×3 ?
How many 3's in 30? In 33? In 36?
3. How many are 10×4 ? 11×4 ? 12×4 ?
How many 4's in 40? In 44? In 48?
4. How many are 10×5 ? 11×5 ? 12×5 ?
How many 5's in 50? In 55? In 60?
5. How many are 10×6 ? 11×6 ? 12×6 ?
How many 6's in 60? In 66? In 72?
6. How many are 10×7 ? 11×7 ? 12×7 ?
How many 7's in 70? In 77? In 84?
7. How many are 10×8 ? 11×8 ? 12×8 ?
How many 8's in 80? In 88? In 96?
8. How many are 10×9 ? 11×9 ? 12×9 ?
How many 9's in 90? In 99? In 108?
9. How many are 10×10 ? 11×10 ? 12×10 ?
How many 10's in 100? In 110? In 120?
10. How many are 10×11 ? 11×11 ? 12×11 ?
How many 11's in 110? In 121? In 132?
11. How many are 10×12 ? 11×12 ? 12×12 ?
How many 12's in 120? In 132? In 144?

EXERCISE 205.—WRITTEN

Copy and commit to memory the following tables:

MULTIPLICATION	DIVISION
$1 \times 11 = 11$	$11 \div 11 = 1$
$2 \times 11 = 22$	$22 \div 11 = 2$
$3 \times 11 = 33$	$33 \div 11 = 3$
$4 \times 11 = 44$	$44 \div 11 = 4$
$5 \times 11 = 55$	$55 \div 11 = 5$
$6 \times 11 = 66$	$66 \div 11 = 6$
$7 \times 11 = 77$	$77 \div 11 = 7$
$8 \times 11 = 88$	$88 \div 11 = 8$
$9 \times 11 = 99$	$99 \div 11 = 9$
$10 \times 11 = 110$	$110 \div 11 = 10$
$11 \times 11 = 121$	$121 \div 11 = 11$
$12 \times 11 = 132$	$132 \div 11 = 12$
<hr/>	
$1 \times 12 = 12$	$12 \div 12 = 1$
$2 \times 12 = 24$	$24 \div 12 = 2$
$3 \times 12 = 36$	$36 \div 12 = 3$
$4 \times 12 = 48$	$48 \div 12 = 4$
$5 \times 12 = 60$	$60 \div 12 = 5$
$6 \times 12 = 72$	$72 \div 12 = 6$
$7 \times 12 = 84$	$84 \div 12 = 7$
$8 \times 12 = 96$	$96 \div 12 = 8$
$9 \times 12 = 108$	$108 \div 12 = 9$
$10 \times 12 = 120$	$120 \div 12 = 10$
$11 \times 12 = 132$	$132 \div 12 = 11$
$12 \times 12 = 144$	$144 \div 12 = 12$

DRILL IN LONG DIVISION

EXERCISE 206. — WRITTEN

The following examples are closely graded for drill in Long Division. The quotient of each division always suggests the next quotient, as in (a) the first quotient "1" suggests the next quotient "1," and the quotient "2" suggests the first quotient "2" in example (b).

$$\begin{array}{r}
 (a) \\
 12 \overline{)1344} 112 \\
 \underline{12} \\
 14 \\
 \underline{12} \\
 24 \\
 \underline{24}
 \end{array}$$

$$\begin{array}{r}
 (b) \\
 12 \overline{)2676} 223 \\
 \underline{24} \\
 27 \\
 \underline{24} \\
 36 \\
 \underline{36}
 \end{array}$$

- | | | | |
|---------------|-----------|----------|-----------|
| 1. 12)144(| 12)276(| 12)408(| 12)540(|
| 2. 12)672(| 12)804(| 12)936(| 12)1068(|
| 3. 12)1176(| 12)1144(| 12)912(| 12)780(|
| 4. 12)648(| 12)516(| 12)384(| 12)252(|
| 5. 12)1344(| 12)2676(| 12)4008(| 12)5340(|
| 6. 12)6672(| 12)8004(| 12)9336(| 12)10668(|
| 7. 12)11976(| 12)10644(| 12)9312(| 12)7980(|
| 8. 12)6648(| 12)5316(| 12)3984(| 12)2652(|
| 9. 13)1589(| 13)4485(| 13)7371(| 13)10257(|
| 10. 13)12831(| 13)9945(| 13)7159(| 13)4173(|

- | | | | |
|--------------|----------|-----------|-----------|
| 11. 13)156(| 13)299(| 13)182(| 13)585(|
| 12. 13)728(| 13)871(| 13)1014(| 13)1157(|
| 13. 13)1274(| 13)1131(| 13)988(| 13)845(|
| 14. 13)702(| 13)559(| 13)416(| 13)273(|
| 15. 14)1568(| 14)1722(| 14)3276(| 14)4830(|
| 16. 14)6384(| 14)7938(| 14)9492(| 14)11046(|
| 17. 15)1680(| 15)1845(| 15)3510(| 15)5175(|
| 18. 15)6840(| 15)8505(| 15)10170(| 15)11835(|

EXERCISE 207. — WRITTEN

Divide the class into two sections. Let the first section find the following or similar products that should be dictated by the teacher :

(a)	(b)	(c)	(d)
16×12	16×23	16×34	16×45

Let the second section find the following products also dictated by the teacher :

(e)	(f)	(g)	(h)
16×56	16×67	16×78	16×89

After the above required products have been found, let the teacher write them on the board, and require the second section to divide examples (a), (b), (c), and (d) by 16.

In the same way require the first section to divide the products of examples (e), (f), (g), and (h).

Continue this method with

17×12	19×12	18×23	17×32	19×34	18×45
17×56	19×56	18×67	17×78	19×78	18×89
18×12	17×23	19×23	18×34	17×45	19×45
18×56	17×67	19×67	18×78	17×89	19×89

EXERCISE 208.—WRITTEN

Many children know the product of 25 multiplied by the several digits, and hence after the preceding drill in dividing by the numbers from 12 to 19 inclusive, it might be well to divide by 25. Write the following examples on the board, or dictate them to the class:

(a)	(b)	(c)	(d)
25)575(	25)1075(	25)1125(	25)1350(
(e)	(f)	(g)	(h)
25)1400(	25)1675(	25)1950(	25)2225(

Ask such questions as: How many are twice 25? Three times 25? Four times 25? Five times 25? Six times 25? Seven times 25? Eight times 25? Nine times 25?

Next point to the several dividends in order, as example (a), and ask: How many 25's in 57? The answer should be, Two and 7 remainder. Finally: How many 25's in 75? Answer: There are three 25's in 75. Follow up this oral questioning with written work, as:

$$\begin{array}{r}
 25)575(23 \\
 \underline{50} \\
 75 \\
 \underline{75}
 \end{array}$$

EXERCISE 209. — WRITTEN

Give thorough drill on many such examples as the following:

$$23)667(\quad 23)1081(\quad 23)874(\quad 23)1288($$

$$23)1541(\quad 23)1127(\quad 23)1794(\quad 23)1449($$

When the divisor is not more than two figures, train the pupil to multiply it mentally by a trial quotient, and compare the product thus obtained with the dividend, as (a) 3 times 23 would be found to be greater than 62, and hence 3 is too great for the quotient figure.

$$\begin{array}{r} (a) \\ 23)621(27 \\ \underline{46} \\ 161 \\ \underline{161} \end{array}$$



